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RESULTS OF ON-SITE
GROUNDWATER AND SOIL SAMPLING
MONTROSE SITE
TORRANCE, CALIFORNIA

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RESULTS OF ON-SITE GROUNDWATER AND SOIL SAMPLING MONTROSE SITE TORRANCE, CALIFORNIA

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CONCLUSIONS

The following conclusions are based on analyses of the results of on-site groundwater and soil sampling performed at the Montrose site in Torrance, California, through July 1985.

1. The upper 80 feet of sediments beneath the site consist of sand, clayey sand, sandy clay, and clay. The upper 69 to 75 feet of these sediments are unsaturated. The lower portion of these sediments consists of sandy clay and clay, and has been designated the Bellflower aquitard.

2. DDT occurs primarily in the fill material above the native sediments, except at monitor well MW-2 and soil boring S-101, where the highest concentrations of DDT are associated with clayey or semi-consolidated sediments throughout the vertical soil section. Concentrations of DDT in soil samples from monitor well MW-2 range from less than 0.6 mg/kg (milligrams/kilogram) to 8,617 mg/kg. Concentrations of DDT in soil samples from soil boring S-101 range from 2.0 mg/kg to 12,621 mg/kg.

3. Chlorobenzene occurs in some soil samples in all the monitor wells. The highest concentrations of chlorobenzene in the soils are associated with clayey or semi-consolidated sediments encountered in monitor well MW-2 and soil boring S-101. In monitor well MW-2, concentrations of chlorobenzene in the soil samples range from less than 0.3 mg/kg to 7,400 mg/kg. The concentrations of chlorobenzene in the soil samples from soil boring S-101 range from 190 mg/kg to 3,800 mg/kg.

4. Other organic compounds detected in the soil samples include tetrachloroethylene, trichloroethylene and trans-1,2-dichloroethylene. These organic coumpounds were detected primarily in the fill material above the native sediments.

5. Depths to water measured in August 1985 in the five monitor wells completed in the Bellflower aquitard ranged from approximately 69.2 feet to approximately 74.4 feet below land surface. The elevation of the water table beneath the site ranged from approximately 25.7 feet to approximately 26.4 feet below mean sea level.

6. Water level measurements collected in the shallow monitor wells on-site indicate that the direction of groundwater flow may be to the southeast.

7. Analysis of common ions in the groundwater samples indicates that two chemical types of groundwater occur beneath the site. Water samples from monitor well MW-1 and MW-2 indicate a sodium sulfate type water. A water sample obtained from monitor well MW-4 indicates a calcium chloride type water.

8. Volatile organic compounds were detected in all of the groundwater samples collected from the monitor wells. These volatile organic compounds include chlorobenzene, chloroform, benzene, carbon tetrachloride, and tetrachloroethylene.

9. DDT was detected in the groundwater sample obtained from monitor well MW-2 in May, 1985. The concentration of DDT in the water sample from this well was 734 ug/l (micrograms/liter). This well is located in the central portion of the Montrose site near the former wastewater impoundment area. DDT was also detected in groundwater samples obtained from monitor wells MW-1, MW-2 and MW-4 in July 1985, at concentrations of 17 ug/l, 2,805 ug/l, and 36 ug/l, respectively.

10. Only a few base/neutral and acid organic compounds were detected in the groundwater samples, including 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2,4-trichlorobenzene, 2-chlorophenol, 2,4-dichlorophenol and phenol. These compounds were detected at concentrations less than 80 ug/l in the groundwater.

RESULTS OF ON-SITE SOIL AND GROUNDWATER SAMPLING MONTROSE SITE TORRANCE, CALIFORNIA

INTRODUCTION

This report summarizes the preliminary results of on-site soil and groundwater sampling at the Montrose site in Torrance, California **(Figure 1)**. The objective of the on-site work was to determine if chemicals of concern used at the Montrose site are present in the shallow groundwater beneath the site. Analyses of soil samples collected during the monitoring well construction were used to determine if chemicals used at the site are present in the vadose zone between land surface and the first water bearing zone.

The design of the on-site sampling program was based on previous on-site sampling performed in June and August, 1983 **(Hargis and Montgomery, 1983)**. During this previous investigation, 31 on-site soil borings were drilled to assess the horizontal and vertical extent of DDT concentrations at the site. In general, the first investigation indicated that the highest concentrations of DDT were found in the upper two feet of soil. At depths greater than two feet, the concentrations of DDT in the soil decreased rapidly, with the majority of samples having concentrations less than 10 mg/kg (milligrams per kilogram). High concentrations of DDT in the soils were found along the west side of the site and beneath the former wastewater impoundment.

To further assess soil contamination and initially assess shallow groundwater conditions on-site five monitor wells were constructed and one deep soil boring was drilled during April and May 1985 **(Figure 2)**. The monitor wells were completed in the first water bearing zone beneath the site. Soil samples were obtained at five-foot intervals during the drilling of the monitor wells using Shelby-type split-tube samplers. Two rounds of groundwater samples were obtained by bailing from the completed wells. Soil boring S-101 was drilled to a total depth of 50 feet in the approximate center of the former wastewater impoundment. Soil samples were collected from soil boring S-101 at five-foot intervals starting at a depth of 22.5 feet at the base of the fill material that was placed in the former wastewater impoundment.

Analytical results for soil samples collected from the soil boring and during construction of the monitor wells are summarized in this report. Analytical results for water samples collected from the monitor wells are also summarized in this report.

GEOLOGIC FRAMEWORK

The Montrose site is located in Torrance, California, approximately six miles east of the Pacific Ocean **(Figure 1)**. The site lies within the Los Angeles Coastal Plain. The Los Angeles Coastal Plain is underlain by a thick sequence of Quaternary and Tertiary age sediments which overlie a basement complex comprised of metamorphic and igneous rocks.

REGIONAL GEOLOGY

The basement complex underlying the Los Angeles Coastal Plain is comprised of crystalline igneous and metamorphic rocks which crop out in the Santa Monica Mountains and Palos Verdes Hills. Tertiary rocks overlying the basement complex consist of sandstones, siltstones, mudstones, and shales. Quaternary age alluvial sediments overlie the Tertiary rocks. The Quaternary alluvial sediments are primarily comprised of sand with lenses and layers of gravel, silt and clay. The alluvial sediments include, in descending order: (1) recent alluvium, (2) older dune sand, (3) Lakewood formation, and (4) San Pedro formation.

Numerous geologic structural features occur on the Coastal Plain. However, no structural features of significance apparently occur in the Montrose site area.

SITE CONDITIONS

Shallow geologic conditions beneath the Montrose site were determined from interpretation of drill cuttings collected during the construction of the five monitor wells, a review of geologic logs of wells located near the site, and review of published geologic literature **(California Department of Water Resources (DWR), 1961)**.

Recent alluvium and the older dune sand are not present in the site area. Upper Pleistocene sediments underlie the site area and comprise the Lakewood formation. Lithologic logs of the monitor wells constructed at the site indicate that the upper 80 feet of sediments are comprised principally of sand, clayey sand, sandy clay, and clay **(Appendix A; Tables A-1 through A-7)**. The logs indicate an upper fine-grained zone of clayey sand, sandy clay, or clay that ranges in thickness from 25 to 30 feet, underlain by a coarser sand zone between 33 and 45 feet thick. This sand zone is underlain by sandy clay, clay and clayey sand. This lower fine-grained unit has been designated the Bellflower aquitard (DWR, 1961).

The sediments above the Bellflower, the Bellflower aquitard and the underlying Gage aquifer comprise the Lakewood formation. Beneath the Lakewood formation lies the San Pedro formation of Lower Pleistocene age. The sands and gravels of the San Pedro formation comprise the Lynwood and Silverado aquifers, often separated by clay or sandy clay aquitards.

HYDROGEOLOGIC UNITS

The Montrose site is underlain by unconsolidated and semi-consolidated sediments of sand, clayey sand, sandy clay, and clay. The upper 69 to 75 feet of sediments are unsaturated. The lower fine-grained unit has been designated the Bellflower aquitard. A generalized geologic cross-section through the Montrose site is presented in **Figure 3**.

BELLFLOWER AQUITARD

The top of the Bellflower aquitard occurs at a depth of between 63 and 70 feet beneath the site. The thickness of the unit beneath the Montrose site is unknown, but may be approximately 50 feet based on the driller's log of the nearby Jones Chemical Company well **(Table 1)**. Only the upper eight to ten feet of the Bellflower aquitard were penetrated by monitor wells MW-1 through MW-5. The portion of the Bellflower aquitard penetrated by the monitor wells consisted of clayey sand, sandy clay, and sand.

GAGE AQUIFER

The Gage aquifer was not penetrated by the monitor wells, but the top of the aquifer is thought to occur at a depth of approximately 120 feet based on the log of the Jones Chemical Company well **(Table 1)**. The Gage aquifer consists of coarse sand with some sandy clay and is overlain by the Bellflower aquitard. The thickness of the Gage aquifer beneath the site is probably about 55 feet **(Table 1)**.

GROUNDWATER CONDITIONS

The Montrose site is located in the West Coast Groundwater Basin which extends from the Ballona Escarpment southeast to the Palos Verdes Hills and San Pedro Bay.

In the West Coast Basin, groundwater is produced from a series of aquifers occurring in the Lakewood and San Pedro formations. These aquifers include the Gage, Lynwood and Silverado aquifers in the site area. Shallow groundwater that may occur in the site area is not used for any purpose **(DWR, 1961)**.

Groundwater encountered beneath the Montrose site occurs within the Bellflower aquitard. It is not known whether this groundwater is in hydraulic connection with groundwater that occurs in the Gage aquifer below the Bellflower aquitard.

WATER LEVELS

Groundwater levels in the monitor wells have been measured five times since the monitor wells were completed in April 1985 **(Tables 2 through 6)**. Water levels were measured on April 27 and 28, on May 1 and 2, on June 7, on July 1 and 2, and on August 1, 1985.

Groundwater occurs in the Bellflower aquitard at depths ranging from approximately 69.2 feet below land surface in monitor well MW-1 to 74.4 feet below land surface in monitor well MW-2 based on the August 1 measurements. The elevation of the water table beneath the site ranges from approximately 25.7 feet below MSL (mean sea level, U.S.G.S. datum) in monitor well MW-2 to 26.4 feet below MSL in monitor well MW-1 **(Tables 2 through 6)**.

Water level measurements collected since April indicate that the water table fluctuates. All of the monitor wells except MW-2 exhibit the same trend in water level fluctuations. In general, water levels rose between the April and May measurements, declined between the May and June measurements, and rose again between the July and August measurements (Figure 4). Water levels in monitor well MW-2 have risen except during the period between the June and July measurements. Water levels in monitor wells MW-3 and MW-5 tend to fluctuate more than water levels in monitor wells MW-1, MW-2, and MW-4.

Between the May and June measurements, the water table apparently declined to a level at or below the bottom of the perforated interval in monitor wells MW-3 and MW-5. The July measurements confirmed that both wells were dry. The cause of this water level decline is not known. Water levels apparently rose in all of the monitor wells during July.

Water levels measured in 1978 in the Gage aquifer in the vicinity of the Del Amo hazardous waste site approximately one-half mile southeast of the Montrose site indicated a depth to water of approximately 81 feet (Ecology and Environment, 1983). The water level elevation in the Gage aquifer was approximately 35 feet below MSL.

More recent water level data for the Gage aquifer are not available. The Los Angeles County Flood Control District discontinued measuring Gage aquifer water levels in the vicinity of the Montrose site in 1978 (personal communication, 1985).

MOVEMENT OF GROUNDWATER

Groundwater elevations measured in the monitor wells since April have fluctuated. Based on the April, May and August measurements, groundwater in the upper water bearing zone may be moving in a southeasterly direction (Tables 2 through 6). The monitor wells penetrate only a few feet into the

Bellflower aquitard. The relationship, if any, between groundwater in the Bellflower aquitard and the underlying Gage aquifer is unknown. Water level elevations measured in the Gage aquifer in the vicinity of the Del Amo hazardous waste site in 1978 indicate that groundwater was moving in an easterly to southeasterly direction (Ecology and Environment, 1983). The direction of groundwater movement in the Gage aquifer beneath the Montrose site is unknown.

CHEMICAL QUALITY OF VADOSE ZONE SEDIMENTS

Chemical quality of the sediments in the vadose zone between land surface and the first water bearing zone was determined from chemical analyses of soil samples collected during drilling of the five monitor wells and one deep soil boring. Soil samples were collected at five-foot intervals using split-tube samplers **(Appendix B)**. Extracts from the soil samples were analyzed for chlorobenzene and other priority pollutant volatile organics, chloral, and DDT. All analyses were performed by Brown and Caldwell Analytical Laboratories, Pasadena, California. Results of all laboratory analyses of soil samples are contained in **Appendix C**. Quality assurance procedures used in the collection, handling, and preservation of the samples are described in **Appendix D**. Quality assurance procedures followed by the laboratory are described in **Appendix E**.

<u>DDT</u>

DDT was detected in the vadose zone soils in monitor wells MW-2, MW-3, and in soil boring S-101 **(Appendix C)**. Concentrations in soils from monitor well MW-2 ranged from less than 0.6 mg/kg (milligrams/kilogram) to 8,616.9 mg/kg of total DDT. Concentrations of DDT in soils from monitor well MW-3 ranged from less than 0.6 to 7.45 mg/kg. Concentrations in the samples from soil boring S-101 ranged from 1.55 mg/kg to 12,621 mg/kg of total DDT. In general, the highest concentrations of total DDT in soil samples from monitor well MW-2 and soil boring S-101 appeared to be associated with clayey sediments or semi-consolidated sediments.

CHLOROBENZENE

Chlorobenzene was detected in vadose zone sediments in all the monitor wells and in soil boring S-101 **(Appendix C)**. Concentrations in soils from monitor well MW-1 ranged from less than 0.3 mg/kg to 2.0 mg/kg. Concentrations in soils from monitor well MW-2 ranged from less than 0.3 mg/kg to 7,400 mg/kg. The highest concentration in a soil sample from monitor well MW-2 was in a saturated soil sample collected below the water table. Concentrations in soils from monitor well MW-3 ranged from none detected to 24.0 mg/kg. In soil from monitor well MW-4, concentrations ranged from none detected to 0.6 mg/kg in one sample. Concentrations of chlorobenzene in soils from monitor well MW-5 ranged from none detected to 0.3 mg/kg in one sample. Concentrations of chlorobenzene ranged from 190 mg/kg to 3,800 mg/kg in soil samples obtained from soil boring S-101. The highest concentrations of chlorobenzene are also associated with clayey or semi-consolidated sediments.

CHLORAL

Analyses for chloral were performed on all soil samples. No chloral above the detection limit of 0.5 mg/kg was found.

OTHER CHEMICALS

Three additional volatile organic compounds were detected in the soil samples **(Appendix C)**. Tetrachloroethylene (PCE) was detected in soil samples collected from monitor wells MW-1, MW-4 and MW-5, and soil boring S-101. Concentrations in soils from monitor well MW-1 ranged from none detected to 1 mg/kg. One soil sample in monitor well MW-4 contained 0.3 mg/kg of PCE. Concentrations of PCE detected in soils from monitor well MW-5 were 0.3 and 0.6 mg/kg, respectively, in two samples. The concentration of PCE was 2.0 mg/kg in one sample collected from soil boring S-101 **(Appendix C)**.

Trichloroethylene (TCE) and trans-1,2-dichloroethylene (1,2-DCE) were also detected in soils from soil boring S-101. TCE was detected in one sample at a concentration of 0.6 mg/kg. Trans-1,2-dichloroethylene was detected in two soil samples collected from soil boring S-101 at concentrations of 0.9 and 30 mg/kg.

DISCUSSION

The above discussion of the chemical quality of the vadose zone sediments would be incomplete without noting that the site has been completely capped with asphalt. Capping of the site has eliminated direct recharge on the site. Because the primary mechanism of transport of the chemical residues is thought to be via the movement of water through the vadose zone, the elimination of direct recharge would reduce the potential for movement of the chemical residues through the vadose zone. While the data indicate some chemical residues remain in the soils, removal of the primary means of transport of these chemicals should reduce the potential for further contamination.

CHEMICAL QUALITY OF GROUNDWATER

Groundwater was encountered in all five monitor wells constructed on the Montrose site. The chemical quality of the groundwater has been determined by laboratory analyses of samples collected from the monitor wells.

Groundwater samples were collected from all of the monitor wells on April 26 and 27, and May 2, 1985 **(Appendix F)**. A second round of groundwater samples were collected from monitor wells MW-1, MW-2, and MW-4 on July 1 and 2, 1985. Monitor wells MW-3 and MW-5 were dry, and could not be sampled. Chemical analyses of the groundwater samples included determination of common ions for wells MW-1, MW-2, and MW-4; priority pollutant volatile organic compounds, base/neutral and acid organics, pesticides, and chloral for all wells. Analyses for common ions in the April and May samples were performed by BC Laboratories, Bakersfield, California. Analyses for common ions, volatile organic compounds, base/neutral and acid organics, pesticides, and chloral in the July samples were performed by Brown and Caldwell Analytical Laboratories, Pasadena, California. All water samples were collected and processed according to EPA protocols. Quality assurance procedures used in the collection, handling, and preservation of the water samples are described in **Appendix D**. Quality assurance procedures followed by the laboratories are described in **Appendix E**.

COMMON IONS

April and May 1985 Samples

Water samples for analysis of common ions were collected from monitor wells MW-1, MW-2 and MW-4. Analysis of water samples from monitor wells MW-1, MW-2 and MW-4 indicate two chemical types of groundwater **(Figure 5)**.

Samples obtained from monitor wells MW-1 and MW-2 indicate a sodium-chloride-sulfate and sodium sulfate type water, respectively **(Appendix G)**. Analysis of a sample from monitor well MW-4 indicates a calcium chloride type water. The total dissolved solids content of the groundwater ranged from 2,010 mg/l in monitor well MW-4 to 13,740 mg/l in monitor well MW-2.

July 1985 Samples

Water samples for analysis of common ions were collected from monitor wells MW-1, MW-2, and MW-4. Analysis of the water sample from monitor well MW-1 indicated a sodium-chloride-sulfate type of groundwater **(Appendix G)**. The calculated total dissolved solids content of the groundwater from well MW-1 was 3,280 mg/l. The calculated total dissolved solids content of the groundwater from wells MW-2 and MW-4 were 9,480 and 1,810, respectively.

VOLATILE ORGANIC COMPOUNDS

April and May 1985 Samples

Priority pollutant volatile organic compounds were detected in the water samples collected from the five monitor wells **(Appendix H)**.

Chlorobenzene and chloroform were detected in groundwater sampled from monitor well MW-1 at concentrations of 1,400 ug/l and 1,100 ug/l, respectively. Benzene was detected at a concentration of 660 ug/l, and tetrachloroethylene at a concentration of 610 ug/l. Other volatile organic compounds detected at concentrations greater than 10 ug/l included 14 ug/l of carbon tetrachloride, 38 ug/l of ethylbenzene, 63 ug/l of methylene chloride, and 30 ug/l of trichloroethylene. Non-priority organics detected in monitor well MW-1 include 2-methylpropane, cyclohexane, cyclopentane, methylcyclopentane, pentane, and xylene isomers.

Chlorobenzene was detected in monitor well MW-2 at a concentration of 54,000 ug/l. Chloroform was also detected at a concentration of 5,800 ug/l. Other volatile organic compounds detected at quantifiable levels in monitor well MW-2 were 100 ug/l of 1,1-dichloroethylene and 150 ug/l of 1,2-dichloroethane **(Appendix H)**.

Monitor well MW-3 contained low concentrations of volatile organic compounds, except for 760 ug/l of chloroform. Other priority volatile organic compounds detected at concentrations greater than 10 ug/l included 40 ug/l of benzene, 59 ug/l of chlorobenzene, 16 ug/l of carbon tetrachloride, 14 ug/l of tetrachloroethylene, and 12 ug/l of trichloroethylene. Non-priority pollutant volatile organic compounds were also detected in monitor well MW-3 **(Appendix H)**.

Groundwater sampled from monitor well MW-4 contained chloroform at a concentration of 3,100 ug/l, tetrachloroethylene at 1,100 ug/l, and chlorobenzene at 850 ug/l. Carbon tetrachloride was also detected at a concentration of 10 ug/l. Other volatile organic compounds were detected below quantifiable levels **(Appendix H)**.

Concentrations of volatile organic compounds were greater in groundwater sampled from monitor well MW-5 than in groundwater sampled from the other monitor wells. Chlorobenzene was detected at a concentration of 93,000 ug/l, and chloroform at a concentration of 24,000 ug/l. Benzene was detected at a concentration of 1,100 ug/l, and tetrachloroethylene occurred at a concentration of 580 ug/l. Other volatile organic compounds detected included 180 ug/l carbon tetrachloride, 50 ug/l ethylbenzene, and 25 ug/l trichloroethylene. Pentane, a non-priority volatile organic, was also detected at a concentration of 1,000 ug/l.

<u>July 1985 Samples</u>

Chlorobenzene and chloroform were detected in groundwater sampled from monitor well MW-1 at concentrations of 15,000 and 1,600 ug/l, respectively.

Benzene and tetrachloroethylene were also detected at concentrations of 3,200 and 950 ug/l, respectively. Other volatile organic compounds detected at concentrations greater than 10 ug/l were ethylbenzene (490 ug/l), and methylene chloride (120 ug/l). Xylene isomers (140 ug/l) were the only non-priority volatiles detected in monitor well MW-1 in the second round at quantifiable levels.

Chlorobenzene was present in monitor well MW-2 at a concentration of 180,000 ug/l, and benzene was present at a concentration of 150 ug/l. Chloroform was detected in the second sampling round in monitor well MW-2 at a concentration of 5,600 ug/l. Other volatile organics detected at concentrations greater than 10 ug/l were 1,2-dichloroethane (150 ug/l), 1,1-dichloroethylene (200 ug/l), and methylene chloride (400 ug/l). Xylene isomers were present at a concentration of 200 ug/l.

Chloroform and tetrachloroethylene were detected in samples obtained from monitor well MW-4 in the second round at concentrations of 4,700 ug/l and 1,300 ug/l, respectively. Chlorobenzene was detected at a concentration of 160 ug/l. Carbon tetrachloride was also detected at 25 ug/l.

BASE/NEUTRAL AND ACID ORGANICS

April and May 1985 Samples

Only a few priority pollutant base/neutral and acid organic compounds were found at concentrations above quantifiable limits in water samples from the monitor wells (Appendix I).

In monitor well MW-1, 1,2,4-trichlorobenzene was detected at a concentration of 11 ug/l, 1,4-dichlorobenzene at 16 ug/l, 2-chlorophenol at 31 ug/l, and phenol at 17 ug/l.

In monitor well MW-2, 1,4-dichlorobenzene was detected at a concentration of 17 ug/l, 2,4-dichlorophenol at 10 ug/l, and 2-chlorophenol at 30 ug/l.

No quantifiable concentrations of priority pollutant base/neutral or acid organic compounds were detected in the water samples from monitor wells MW-3 and MW-4.

In monitor well MW-5, 1,2,4-trichlorobenzene was detected at a concentration of 10 ug/l, 1,2-dichlorobenzene at a concentration of 10 ug/l, 1,4-dichlorobenzene at 27 ug/l, and 2-chlorophenol at 71 ug/l.

<u>July 1985 Samples</u>

In the second round of sampling, low concentrations of a few base/neutral and acid organics were again detected in groundwater samples obtained from monitor wells MW-1, MW-2, and MW-4 **(Appendix I)**.

In monitor well MW-1, bis(2-ethylhexyl) phthalate was detected at a concentration of 40 ug/l, 1,2-dichlorobenzene at a concentration of 13 ug/l, 1,4-dichlorobenzene at a concentration of 38 ug/l, naphthalene at a concentration of 10 ug/l, and 1,2,4-trichlorobenzene at a concentration of 31 ug/l. Several non-priority base/neutral and acid organics were detected at concentrations less than 50 ug/l **(Appendix I)**.

In monitor well MW-2, 1,4-dichlorobenzene (67 ug/l) and 2-chlorophenol (37 ug/l) were present above quantifiable limits. Some non-priority base/neutral and acid organics were present including chlorobenaldehyde (600 ug/l), chlorobenzoic acid isomers (1,000 ug/l) and methyl chlorobenzoate (50 ug/l). An unidentified chlorinated aromatic was also present at a concentration of 200 ug/l.

No priority base/neutral and acid organics were present in monitor well MW-4 at concentrations greater than quantifiable limits.

PESTICIDES

April and May 1985 Samples

Priority pollutant pesticides above quantifiable concentrations were only detected in water samples collected from monitor wells MW-1 and MW-2 (Appendix J). The alpha, beta, and gamma isomers of BHC were detected at concentrations of 200 ug/l (micrograms/liter), and 18 ug/l, and 20 ug/l in the groundwater sample collected from monitor well MW-1. A groundwater sample from monitor well MW-2 contained 734 ug/l of total DDT.

July 1985 Samples

Priority pollutant pesticides were present in the three monitor wells sampled during the second round of sampling. BHC isomers were detected in groundwater from monitor well MW-1 at concentrations of 200 ug/l (alpha isomer), 29 ug/l (beta isomer), 33 ug/l (gamma isomer), and 6.6 ug/l (delta isomer). DDT was also detected in groundwater from monitor well MW-1 at a concentration of 17 ug/l. Total DDT concentrations in groundwater from monitor wells MW-2 and MW-4 were 2805 ug/l and 36 ug/l, respectively. No other priority pollutant pesticides were detected above quantifiable limits in monitor wells MW-2 and MW-4.

CHLORAL

Analyses for chloral were performed on all water samples collected in April, May, and July. No chloral above the detection limit of 5 ug/l was found.

DISCUSSION

Chlorobenzene and chloroform were detected in water samples from all wells **(Figure 6)**. Concentrations of chlorobenzene and chloroform were highest in wells MW-2 and MW-5. Tetrachloroethylene was detected in water samples from all wells **(Figure 6, Table H-1)**. Concentrations of tetrachloroethylene in water samples from wells MW-2 and MW-3 were less than 50 ug/l. Benzene was detected in water samples from all wells. Benzene concentrations in water samples from MW-4 were less than 5 ug/l. Carbon tetrachloride in quantifiable amounts was found in water samples from MW-3, MW-4 and MW-5 indicating a distribution similar to tetrachloroethylene **(Figure 6)**. Methylene chloride was detected in water samples from MW-2 and MW-1 with traces detected in water samples from MW-4. Ethylbenzene was detected in water samples from MW-1 and MW-5.

DDT was detected in water samples from MW-1, MW-2 and MW-4. Concentrations of DDT were highest in water samples from MW-2.

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TABLES

TABLE 1

DRILLER'S LOG OF JONES CHEMICAL COMPANY WELL

From	To	Classification of Materials
		Upper Pleistocene Deposits
0	3	Black adobe
3	32	Clay yellow
32	53	Cemented shells
53	71	Sand dry
71	102	Clay yellow
102	121	Clay blue
		"200-foot sand" from 121 to 174 feet
121	126	Coarse sand, dirty yellow
126	137	Clay blue sandy
137	161	Coarse sand, dirty yellow
161	174	Coarse sand, dirty blue
		San Pedro Formation
174	187	Sea mud
187	248	Clay blue
		"400-foot gravel" from 248 to 282 feet
248	262	Coarse sand blue
262	271	Sand and gravel 1/16"
271	282	Sand and gravel 1/8"
282	398	Clay blue
398	413	Cemented sand
413	458	Gravelly clay
458	486	Cemented gravel
		Silverado Zone from 486 to over 727 feet
486	519	Gravel tight dirty 1"
519	560	Gravel loose 1/2"
560	599	Clay blue
599	650	Gravel 1"
650	714	Gravel 3/4"
714	727	Clay blue sand

Source: Los Angeles County Flood Control District

TABLE 2

WATER LEVELS AT MONITOR WELL MW-1

Date	Reference Point Elevation (Feet amsl)[1]	Depth To Water (Feet)	Water Level Elevation (Feet bmsl)[2]	Method of Measuring
4-27-85	42.77	69.51	-26.74	Sounder
5-1-85	42.77	69.50	-26.73	Sounder
6-7-85	42.77	70.03	-27.26	Steel Tape
7-1-85	42.77	69.23	-26.46	Sounder
8-1-85	42.77	69.18	-26.41	Sounder

1 Reference point refers to top of PVC casing, north side.
amsl - above mean sea level.

2 bmsl - below mean sea level.

TABLE 3

WATER LEVELS AT MONITOR WELL MW-2

Date	Reference Point Elevation (Feet amsl)[1]	Depth To Water (Feet)	Water Level Elevation (Feet bmsl)[2]	Method of Measuring
4-28-85	48.77	74.96	-26.19	Sounder
5-1-85	48.77	74.80	-26.03	Sounder
6-7-85	48.77	74.58	-25.81	Steel Tape
7-2-85	48.77	74.66	-25.89	Sounder
8-1-85	48.77	74.43	-25.66	Sounder

1 Reference point refers to top of PVC casing, north side.
amsl - above mean sea level.

2 bmsl - below mean sea level.

TABLE 4

WATER LEVELS AT MONITOR WELL MW-3

Date	Reference Point Elevation (Feet amsl)[1]	Depth To Water (Feet)	Water Level Elevation (Feet bmsl)[2]	Method of Measuring
4-27-85	47.66	73.80	-26.14	Sounder
5-2-85	47.66	72.1	-24.44	Sounder
6-7-85	47.66	Dry	Dry	Steel Tape
7-2-85	47.66	Dry	----	Sounder
8-1-85	47.66	73.51	-25.85	Sounder

1 Reference point refers to top of PVC casing, north side.
amsl - above mean seal level.

2 bmsl - below mean sea level.

TABLE 5

WATER LEVELS AT MONITOR WELL MW-4

Date	Reference Point Elevation (Feet amsl)[1]	Depth To Water (Feet)	Water Level Elevation (Feet bmsl)[2]	Method of Measuring
4-27-85	47.08	73.05	-25.97	Sounder
5-1-85	47.08	73.0	-25.92	Sounder
6-7-85	47.08	73.25	-26.17	Steel Tape
7-2-85	47.08	72.96	-25.88	Sounder
8-1-85	47.08	72.76	-25.68	Sounder

1 Reference point refers to top of PVC casing, north side.
amsl - above mean sea level.

2 bmsl - below mean sea level.

TABLE 6

WATER LEVELS AT MONITOR WELL MW-5

Date	Reference Point Elevation (Feet amsl)[1]	Depth To Water (Feet)	Water Level Elevation (Feet bmsl)[2]	Method of Measuring
4-27-85	45.16	71.61	-26.45	Sounder
5-2-85	45.16	71.00	-25.84	Sounder
6-7-85	45.16	Dry	Dry	Steel Tape
7-2-85	45.16	Dry	----	Sounder
8-1-85	45.16	71.31	-26.15	Sounder

1 Reference point refers to top of PVC casing, north side.
amsl - above mean sea level.

2 bmsl - below mean sea level.

ILLUSTRATIONS

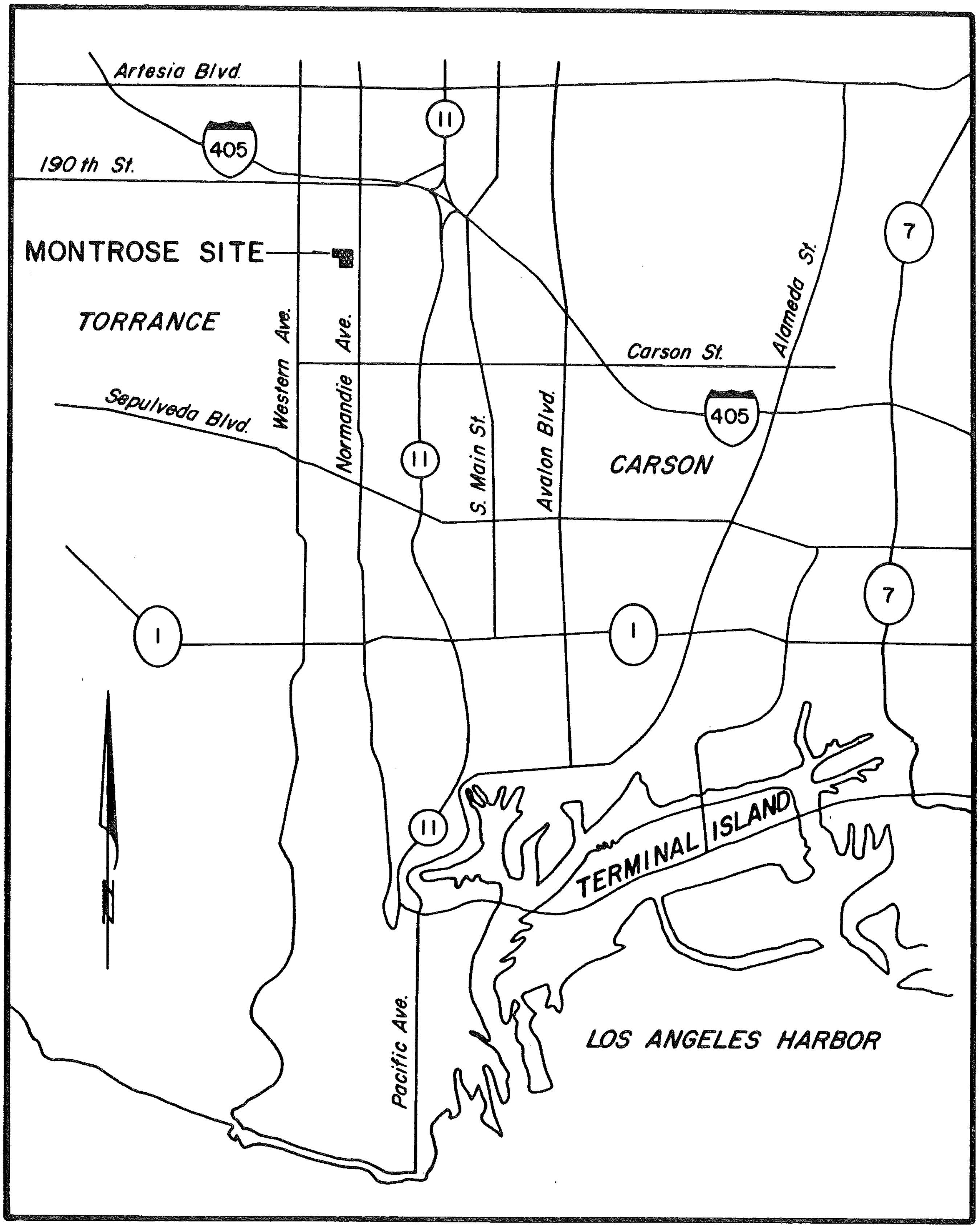
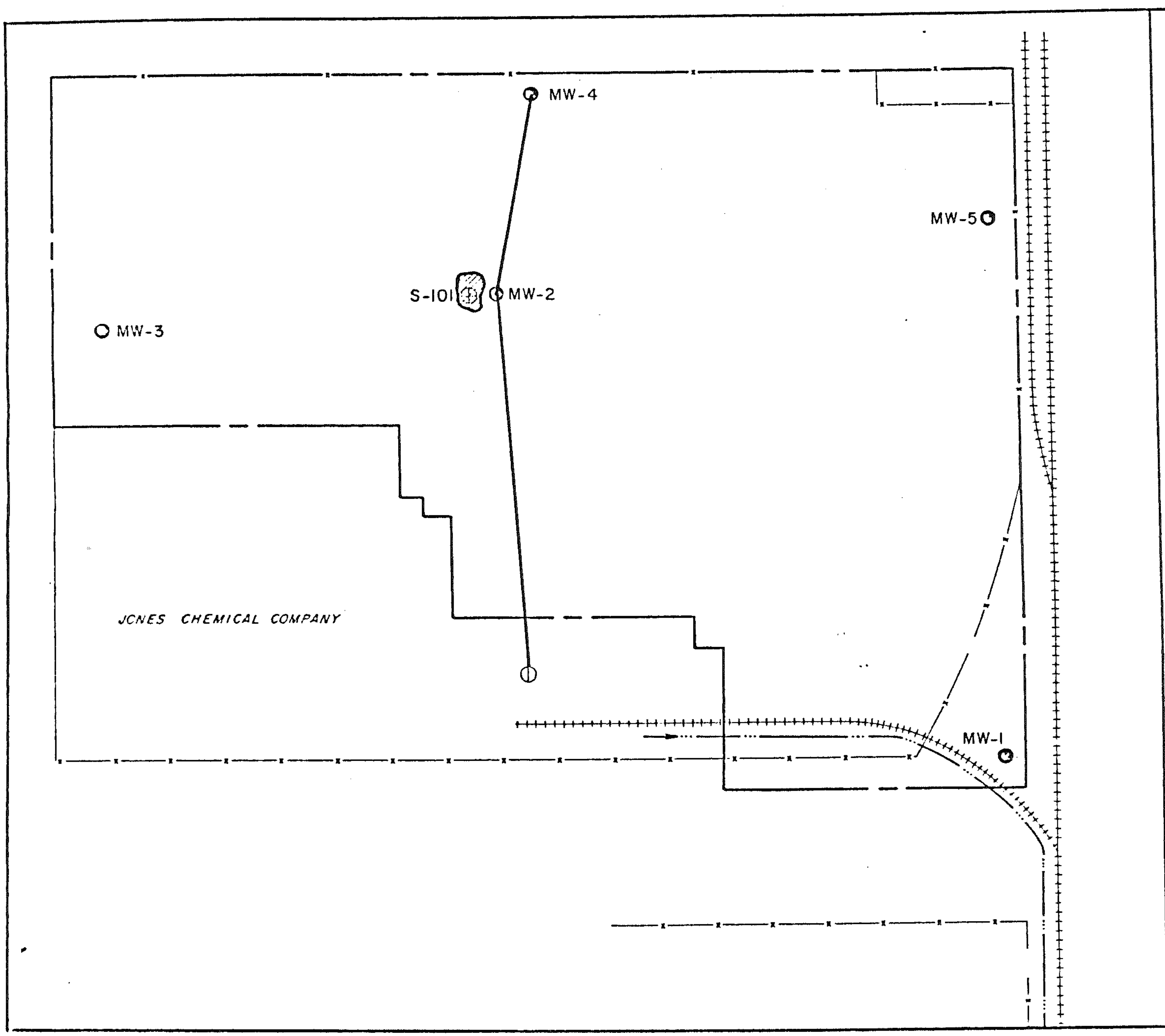


FIGURE 1. LOCATION OF MONTROSE SITE

HARGIS + ASSOCIATES, INC.

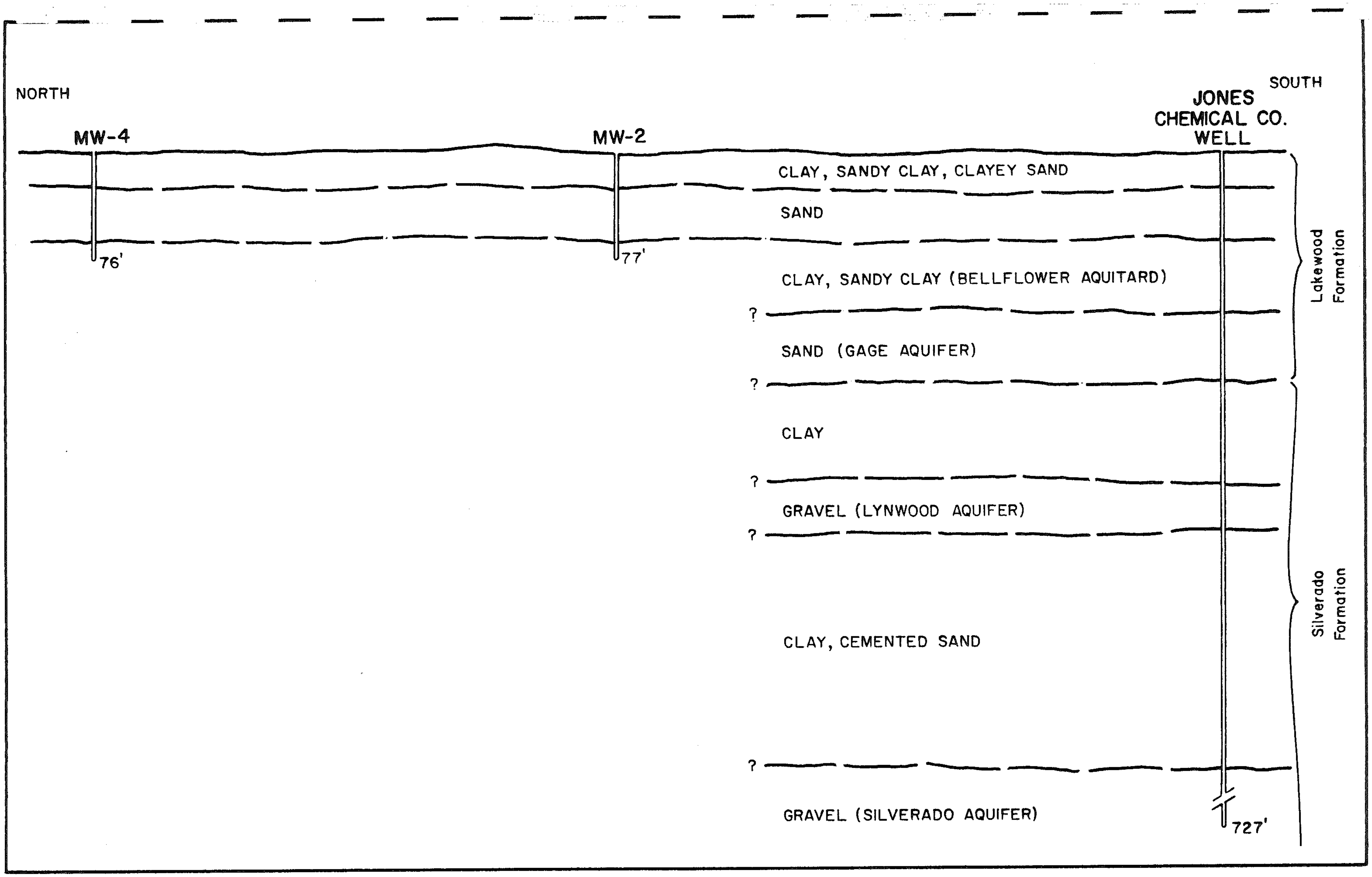
BOE-C6-0179016



MONTROSE CHEMICAL CORPORATION
TORRANCE, CALIFORNIA

LOCATION OF
MONITOR WELLS AND SOIL BORING

HARGIS + ASSOCIATES, INC.
Consultants in Hydrogeology 1985
San Diego, California
FIGURE 2



Approximate Vertical Scale 1" = 100'

Log of Jones Chemical Co. well from Los Angeles County Flood Control District

HARGIS + ASSOCIATES, INC.

FIGURE 3. GENERALIZED GEOLOGIC CROSS-SECTION

BOE-C6-0179018

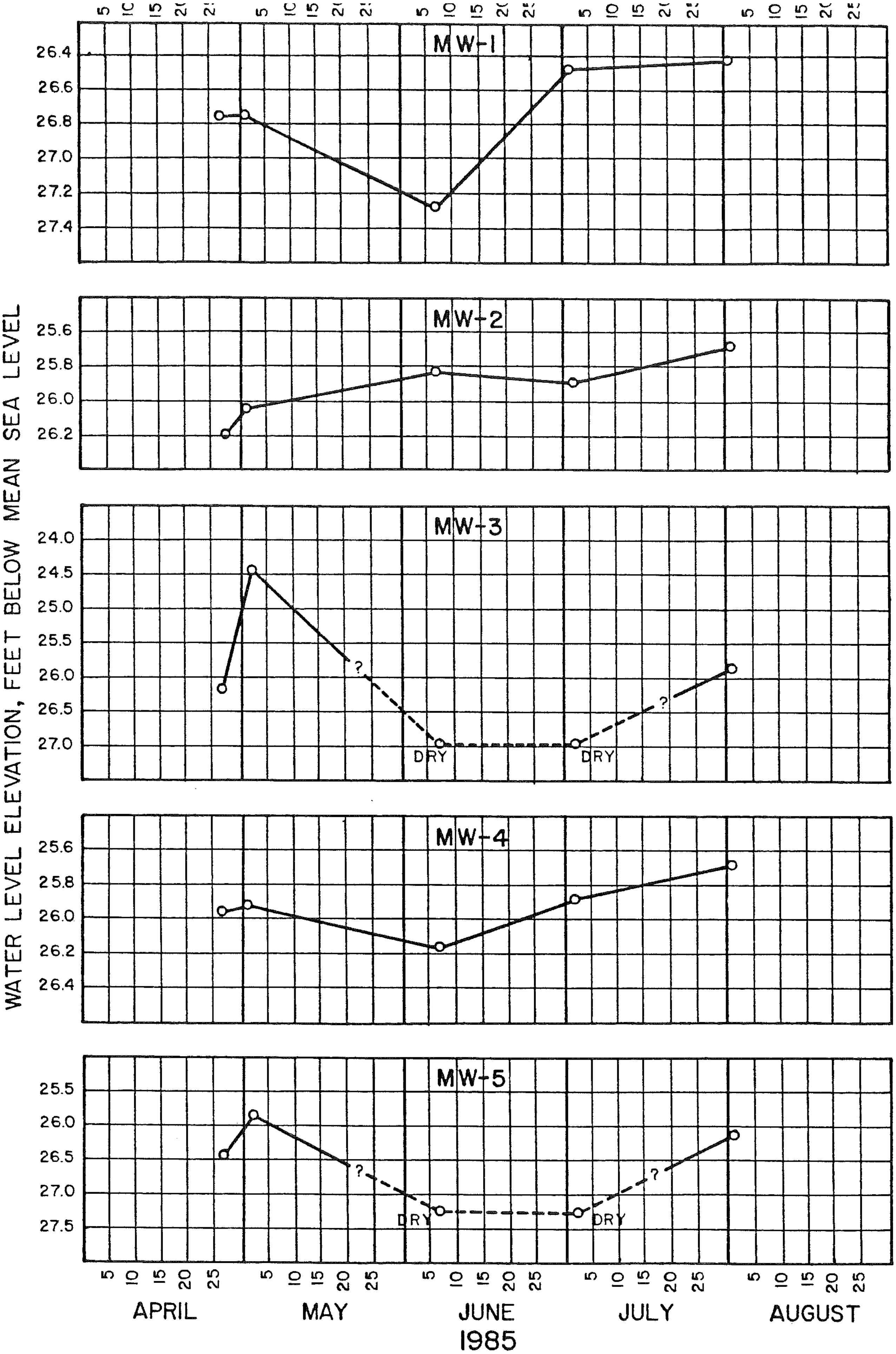
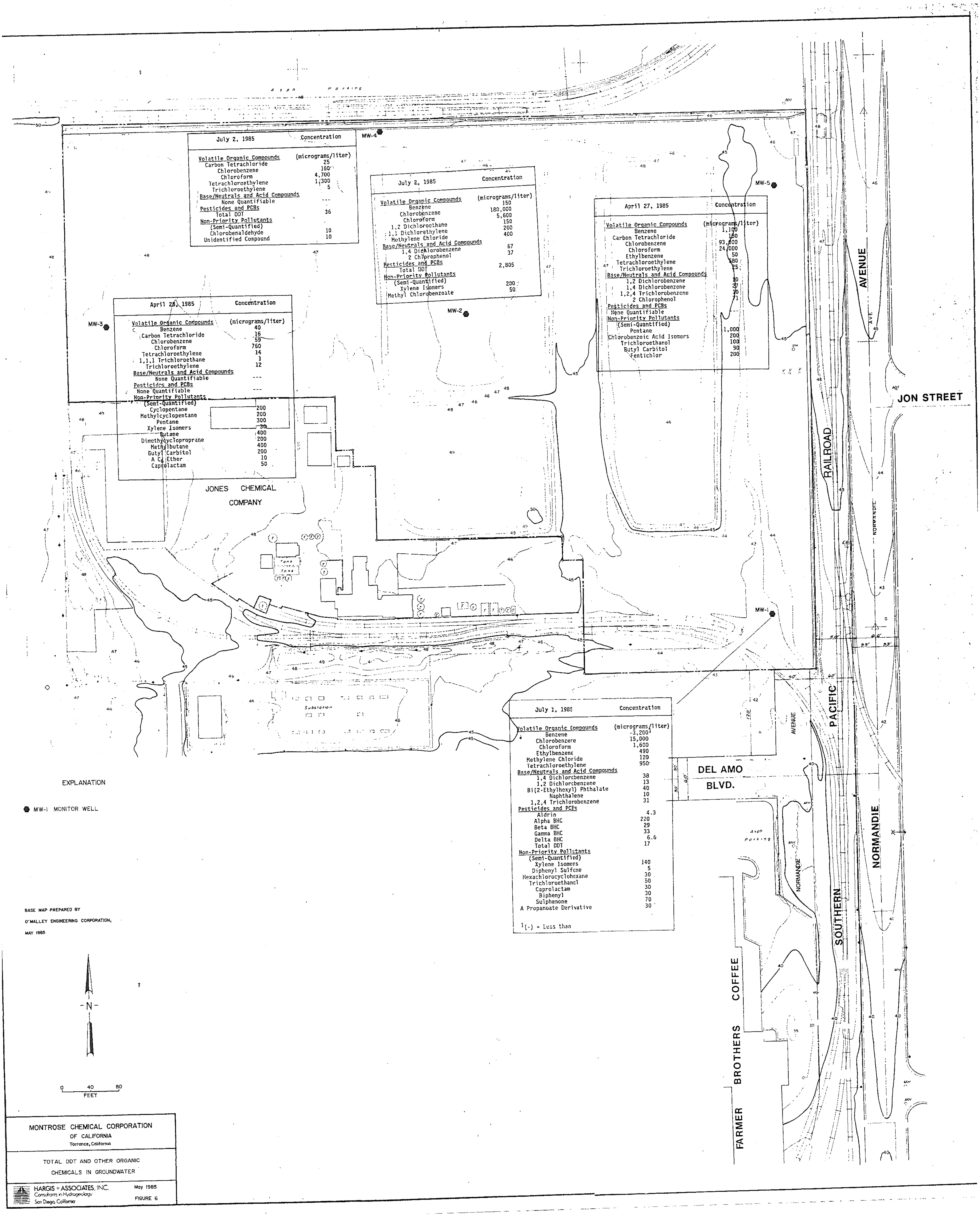
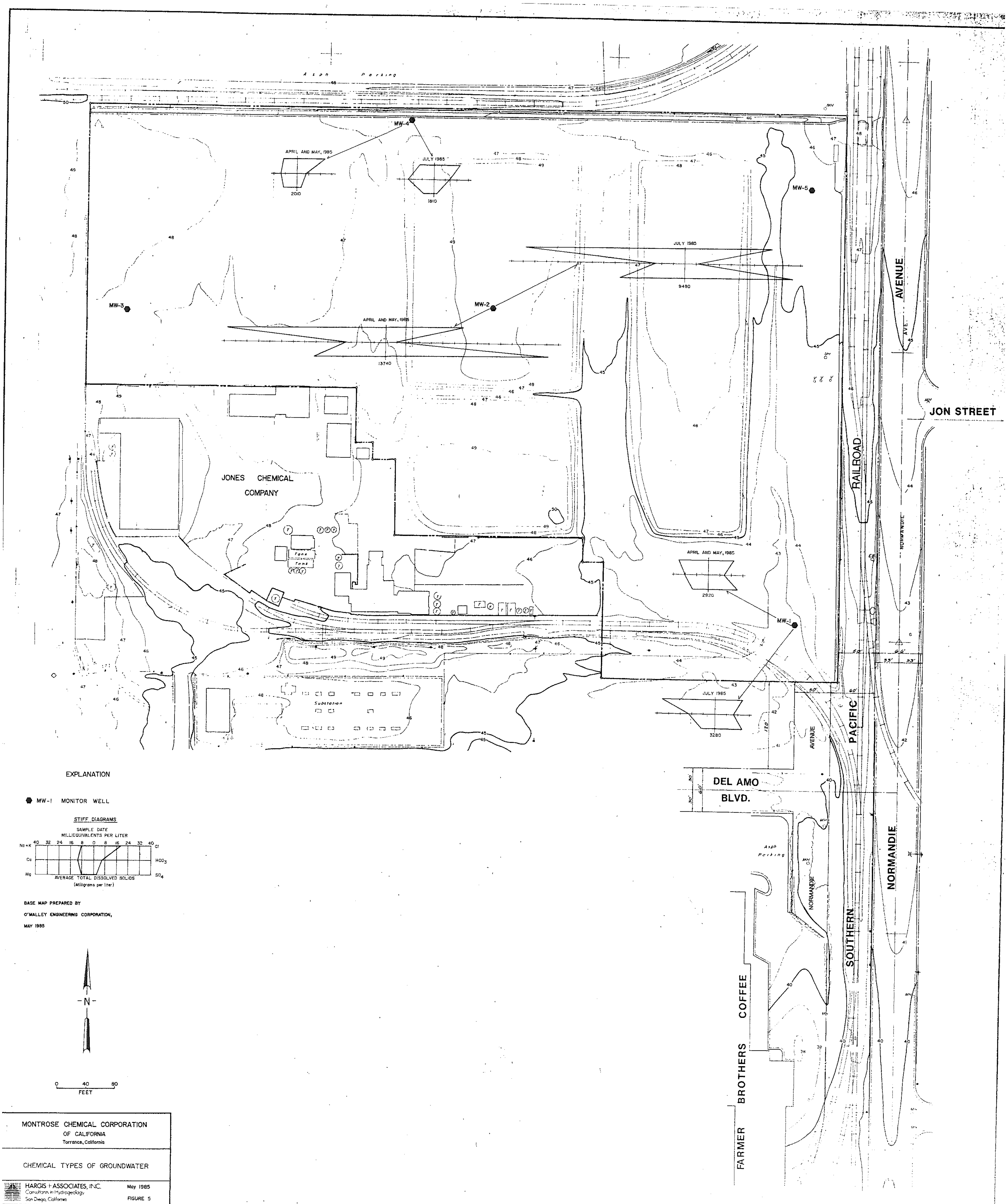


FIGURE 4. HYDROGRAPHS OF WATER LEVELS IN MONITOR WELLS

HARGIS + ASSOCIATES, INC.


Asph Parking
July 2, 1985 Concentration
Volatile Organic Compounds (micrograms/liter)
Carbon Tetrachloride 25
Chlorobenzene 160
Chloroform 4,700
Tetrachloroethylene 1,300
Trichloroethylene 5
Base/Neutrals and Acid Compounds
None Quantifiable ---
Pesticides and PCBs
Total DDT 36
Non-Priority Pollutants
(Semi-Quantified)
Chlorobenaldehyde 10
Unidentified Compound 10
MW-4
July 2, 1985 Concentration
Volatile Organic Compounds (micrograms/liter)
Benzene 150
Chlorobenzene 180,000
Chloroform 5,600
1,2 Dichloroethane 150
1,1 Dichlorethylene 200
Methylene Chloride 400
Base/Neutrals and Acid Compounds
1,4 Dichlorobenzene 67
2 Chlorophenol 37
Pesticides and PCBs
Total DDT 2,805
Non-Priority Pollutants
(Semi-Quantified)
Xylene Isomers 200
Methyl Chlorobenzoate 50
MW-2
MW-5
April 27, 1985 Concentration
Volatile Organic Compounds (micrograms/liter)
Benzene 1,100
Carbon Tetrachloride 180
Chlorobenzene 93,000
Chloroform 24,000
Ethylbenzene 50
Tetrachloroethylene 580
Trichloroethylene 25
Base/Neutrals and Acid Compounds
1,2 Dichlorobenzene 10
1,4 Dichlorobenzene 27
1,2,4 Trichlorobenzene 10
2 Chlorophenol 11
Pesticides and PCBs
None Quantifiable
Non-Priority Pollutants
(Semi-Quantified)
Pentane 1,000
Chlorobenzoic Acid Isomers 200
Trichloroethanol 100
Butyl Carbitol 90
Fentichlor 200
MW-3
April 28, 1985 Concentration
Volatile Organic Compounds (micrograms/liter)
Benzene 40
Carbon Tetrachloride 16
Chlorobenzene 59
Chloroform 760
Tetrachloroethylene 14
1,1,1 Trichloroethane 1
Trichloroethylene 12
Base/Neutrals and Acid Compounds
None Quantifiable ---
Pesticides and PCBs
None Quantifiable ---
Non-Priority Pollutants
(Semi-Quantified)
Cyclopentane 200
Methylcyclopentane 200
Pentane 300
Xylene Isomers 30
Butane 400
Dimethylcyclopropane 200
Methylbutane 400
Butyl Carbitol 200
A C6 Ether 10
Caprolactam 50
JONES CHEMICAL
COMPANY
Tank
Tank
Substation
MW-1
July 1, 1985 Concentration
Volatile Organic Compounds (micrograms/liter)
Benzene -3,200[1]
Chlorobenzene 15,000
Chloroform 1,600
Ethylbenzene 490
Methylene Chloride 120
Tetrachloroethylene 950
Base/Neutrals and Acid Compounds
1,4 Dichlorobenzene 38
1,2 Dichlorobenzene 13
Bi(2-Ethylhexyl) Phthalate 40
Naphthalene 10
1,2,4 Trichlorobenzene 31
Pesticides and PCBs
Aldrin 4.3
Alpha BHC 220
Beta BHC 29
Gamma BHC 33
Delta BHC 6.6
Total DDT 17
Non-Priority Pollutants
(Semi-Quantified)
Xylene Isomers 140
Diphenyl Sulfone 5
Hexachlorocyclohexane 30
Trichloroethanol 50
Caprolactam 30
Biphenyl 30
Sulphenone 70
A Propanoate Derivative 30
1(-) = Less than
JON STREET
RAILROAD
AVENUE
NORMANDIE
PACIFIC
SOUTHERN
NORMANDIE
AVENUE
DEL AMO
BLVD.
Asph Parking
NORMANDIE
FARMER BROTHERS COFFEE
EXPLANATION
MW-1 MONITOR WELL
BASE MAP PREPARED BY
O'MALLEY ENGINEERING CORPORATION,
MAY 1985
N
0 40 80
FEET
MONTROSE CHEMICAL CORPORATION
OF CALIFORNIA
Torrance, California
TOTAL DDT AND OTHER ORGANIC
CHEMICALS IN GROUNDWATER
HARGIS + ASSOCIATES, INC.
Consultants in Hydrogeology
San Diego, California
May 1985
FIGURE 6



Asph Parking
MW-4
APRIL AND MAY, 1985
2010
JULY 1985
1810
MW-5
JULY 1985
9480
MW-3
MW-2
APRIL AND MAY, 1985
13740
JONES CHEMICAL COMPANY
Tank
Substation
APRIL AND MAY, 1985
2920
MW-1
JULY 1985
3280
AVENUE
JON STREET
RAILROAD
NORMANDIE
PACIFIC
SOUTHERN
DEL AMO BLVD.
Asph Parking
FARMER BROTHERS COFFEE
EXPLANATION
MW-1 MONITOR WELL
STIFF DIAGRAMS
SAMPLE DATE
MILLIEQUIVALENTS PER LITER
Na+K 40 32 24 16 8 0 8 16 24 32 40 Cl
Ca HCO3
Mg SO4
AVERAGE TOTAL DISSOLVED SOLIDS (Milligrams per liter)
BASE MAP PREPARED BY O'MALLEY ENGINEERING CORPORATION, MAY 1985
N
0 40 80
FEET
MONTROSE CHEMICAL CORPORATION OF CALIFORNIA
Torrance, California
CHEMICAL TYPES OF GROUNDWATER
HARGIS + ASSOCIATES, INC.
Consultants in Hydrogeology
San Diego, California
May 1985
FIGURE 5

APPENDIX A

APPENDIX A

DRILLING AND CONSTRUCTION OF MONITOR WELLS

DRILLING AND CONSTRUCTION OF MONITOR WELLS

In accordance with the on-site groundwater sampling plan (Hargis & Associates, 1985), a total of five monitor wells were constructed on the site to obtain groundwater samples from the uppermost water bearing zone **(Figure 2)**. These monitor wells were also constructed to define geologic conditions. Soil samples were collected during the drilling of the monitor wells. All of the monitor wells were completed in the upper portion of the first water bearing zone.

All of the monitor wells were constructed in April 1985 by A&W Drilling, Inc., Los Angeles, California. Each well was drilled to a depth of approximately ten feet below land surface using a 24-inch bucket auger. Ten feet of eighteen-inch steel surface casing was then set and cemented. Each borehole was then completed to total depth using a 16-inch bucket auger. Caving conditions at the water table prevented penetration of more than a few feet below the water table.

Detailed lithologic logs were compiled during drilling of the monitor boring **(Tables A-1 through A-7)**. Soil samples were obtained at five-foot intervals using a split-tube sampler. Monitor well MW-2 was initially located about 20 feet south of the location shown on **Figure 2**. Concrete debris and other materials were encountered at a depth of about 20 feet below land surface and the hole could not be advanced. This hole was abandoned, and is designated soil boring MW-2A **(Table A-2)**. The abandoned hole was backfilled with the cuttings. The drilling equipment was steam cleaned, moved 20 feet north, and monitor well MW-2 was constructed **(Figure 2)**.

No drilling fluids or mud were used in the construction of the monitor wells. With the exception of the first 10 feet of cuttings, all drill cuttings were stockpiled at the wellsite. The cuttings from the first ten feet of each borehole were removed from the vicinity of each borehole and stored in a steel bin at the eastern end of the site. Upon completion of drilling, the steel bin was covered with sheet plastic to prevent dissipation of the cuttings by the wind. The bucket auger rig was steam cleaned prior to drilling each monitor well, and after completion of the last monitor well.

All monitor wells were constructed with four-inch flush-threaded schedule 40 PVC blank and slotted casing. Casing slots are one inch long by 0.030-inch wide. The four-inch casing contains 160 slots per foot. A ten-foot joint of slotted casing was set on the bottom of each borehole **(Figures A-2 through A-6)**. Blank casing was installed from above the slotted casing to land surface. The annulus between the PVC casing and the borehole wall was then filled with a clean, dry Monterey sand to a depth of between 5.5 and 8.5 feet above the slotted casing. After placement of the sand pack, the annulus was backfilled with dry cuttings to within ten feet of land surface. The annulus was then sealed to land surface with concrete. The top of the PVC casing was cut off below land surface and capped with a PVC cap. A three-foot long joint of eight-inch steel casing was then cemented in place over the PVC. This steel casing is fitted with a locking lid. Construction data for each monitor well are presented in **Table A-8.**

The as-built details of the monitor wells differ from the construction proposed in the on-site sampling plan in several respects. Based on comments received via letter from EPA dated 24 April 1985, the well construction was modified to include steel surface casing cemented from land surface to a depth of ten feet. Because of the dry nature of the sediments encountered above the water table, the cement bentonite seal above the gravel pack was unnecessary and was not installed. The borehole annulus of each well was backfilled with dry cuttings from that well instead of backfilling with imported soil or pea gravel. Because the site is now paved and no source of recharge exists that might create a perched groundwater zone beneath the site, it was unnecessary to import clean soil or pea gravel to backfill the annulus. Without a source of recharge, chemical residues that might be present in the backfilled cuttings would probably not be transported to the water table. The ten-foot surface cement seal provides additional protection against potential infiltration of surface runoff.

TABLE A-1

LITHOLOGIC LOG OF MONITOR WELL MW-1

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-1.5	Fill:	Asphalt, bricks, in clay matrix.
1.5-6	Clay:	Some sand, dark brown, slightly moist, very stiff, cohesive.
6-11	Clayey sand/ sandy clay:	Light yellow brown, slightly moist, firm, moderately cohesive, sand is fine grained.
11-18	Sandy clay:	Light brown, dry, firm. At 15-18 feet, increasing sand.
18-22	Clayey sand:	Light brown, dry, loose, very fine grained. At 20-22 feet, increasing clay.
22-28	Sandy clay:	Light brown with dark brown streaks, dry. At 25-28 feet, increasing sand.
28-30	Sand:	Very light brown, dry, loose, very fine grained, trace of clay.
30-37	Sand:	Very light brown, dry, loose. At 35-37 feet, trace of clay.
37-40	Sand:	Very light brown, dry, loose.
40-49	Sand:	Light yellowish brown, slightly moist, very fine grained, loose, with occasional trace of clay, slightly sweet odor, occasional orange staining. At 46 feet, sand, light orange brown. At 47 feet, sand, light yellow brown. At 48 feet, sand, light orange brown. At 49 feet, cemented zone, sand is very fine grained, with some shell fragments.

TABLE A-1

LITHOLOGIC LOG OF MONITOR WELL MW-1 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
49-53	Sand:	Light yellow brown, slightly moist, loose with occasional well-cemented nodules, sand is very fine grained, occasional thin clay lenses, no odor.
53-64	Sand:	Light yellow brown, occasional orange stains, slightly moist, loose, sand very fine grained, slight sweet odor. At 64 feet, slight increase in clay content.
64-69	Sand:	Light yellow brown, slightly moist, loose, sand is very fine grained, no odor, some clay nodules, clay is firm, slightly cohesive. At 68 feet, clayey sand, light brown, moist, firm, sand is very fine grained, clay is moderately cohesive. At 69.5 feet, water.
69-77	Sand:	Interbedded with clayey sand, light brown, wet, sand is loose, fine grained, clay is firm, moderately cohesive, interbeds average about 3 inches, occasional orange staining. At 75 feet, clayey sand, interbedded with sand, light brown, moist, sand is fine grained, clay is firm, moderately cohesive At 77 feet, sandy clay with some sand stringers, light brown with orange brown lenses, wet, very firm, very cohesive, sand is fine grained.

TABLE A-2

LITHOLOGIC LOG OF MONITOR WELL MW-2A

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-10	Fill:	Concrete wood, bricks, in clay matrix, sweet organic odor.
		Hole abandoned by backfilling with cuttings; move 20 feet north and start MW-2.

TABLE A-3

LITHOLOGIC LOG OF MONITOR WELL MW-2

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-4	Fill:	Concrete, asphalt fragments, wood, bricks in clay matrix.
4-6	Clay:	Dark brown, slightly moist, very stiff, very cohesive, trace of sand.
6-11	Clayey sand:	Light yellow brown, slightly moist, loose, fine grained, clay is moderately cohesive.
11-15	Sandy clay:	Light brown, slightly moist, firm, moderately cohesive.
15-24	Clay:	Gray brown, slightly moist, stiff, very odiferous. At 22 feet, purple concretions.
24-27	Sandy clay:	Brown, slightly moist, loose, sand is fine grained, stiff clay interbeds, intermixed purple concretions.
27-29	Clay sand:	Brown, slightly moist, loose, uniform, sand is fine grained. At 28 feet, sand is tan, occasional clay masses. At 29 feet, sparse shell fragments.
29-43	Sand:	Reddish brown, slightly moist, loose, uniform, fine grained. At 32 feet, more micaceous. At 35 feet, shell fragments consolidated. At 37-38 feet, consolidated shell zones, well cemented, occasional clay. At 40 feet, purple concretions of shell material, stained black.

TABLE A-3

LITHOLOGIC LOG OF MONITOR WELL MW-2 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
		At 41 feet, more cemented, black stain, odiferous.
		At 42 feet, sand is gray in color.
43-77	Sand:	Reddish brown, slightly moist, odiferous, loose, fine grained.
		At 46 feet, interbeds of sandy clay/clay, interspersed oxidized zones, trace of stiff cobble-sized clay masses.
		At 52 feet, well cemented sandy clay nodules.
		At 54-55 feet, well cemented sand with shell fragments.
		At 58 feet, interspersed oxidized zones.
		At 63 feet, some consolidated, cemented shell fragments.
		At 64 feet, sand is gray, very odiferous.
		At 65 feet, sand is reddish brown, some clay nodules, occasional cemented sand nodules.
		At 66 feet, sand is gray.
		At 68 feet, some shell fragments
		At 70 feet, increasing moisture, sandy clay lens, clay is stiff.
		At 72-73 feet, more sandy clay interbeds.
		At 73-74 feet, interbeds of sandy clay/clayey sand.
		At 75 feet, interbeds of sandy clay with some well cemented clayey sand.

TABLE A-3

LITHOLOGIC LOG OF MONITOR WELL MW-2 (Continued)

DEPTH INTERVAL (FEET)	DESCRIPTION OF MATERIAL	
77-78	Sandy clay:	Light brown, slightly moist, odiferous, firm, moderately cohesive, sand is very fine grained.
78-80	Clayey sand:	Light brown, saturated, streaks of coarser orange sand.

TABLE A-4

LITHOLOGIC LOG OF MONITOR WELL MW-3

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-3.5	Fill:	Asphalt fragments, brown clay matrix.
3.5-9	Clay sand:	Light brown, slightly moist, no odor, slightly cohesive, dense.
9-10	Sandy clay:	Light brown, moist, no odor, cohesive, firm.
10-16	Sandy clay:	Brown, slightly moist, clay is moderately cohesive, sand is fine grained, loose.
		At 14 feet, clay interbeds, clay is moist, stiff, gray, has some sand, very fine grained, sand is brown, slightly red.
16-18	Clay:	Some sand, clay is slightly moist, stiff, reddish brown.
18-19	Sandy clay:	Reddish brown, slightly moist, very fine grained, clay is moderately cohesive.
19-22	Clayey sand:	Reddish brown, slightly moist, sand is very fine grained, clay is moderately cohesive.
		At 21 feet, interbeds of sandy clay.
22-25	Sand:	Reddish brown to tan, slightly moist, loose, uniform, fine grained, trace of clay.
25-44	Sand:	Reddish brown, slightly moist, loose, uniform, fine grained.
		At 33 feet, small clay nodules.
		At 36 feet, sand is lighter in color.
		At 37 feet, clay nodules, some medium sand.
		At 39 feet, sand is redder, moister.
		At 40 feet, sand is tan, grayish tan, some interbeds of clayey sand.

TABLE A-4

LITHOLOGIC LOG OF MONITOR WELL MW-3 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
		At 42 feet, interbeds of shells in clayey matrix.
		At 43 feet, shells in moist clayey sand matrix, sand is medium grained, loose.
44-46	Clayey sand:	Gray to brown, moist, sand is medium grained, red oxidation bands, some shell fragments.
46-67	Sand:	Gray-brown, slightly moist, fine grained, loose, uniform, trace of clay.
		At 49 feet, changes to rust colored, micaceous, some burnt orange, slightly cohesive nodules.
		At 55 feet, orange sand.
		At 56 feet, some clayey sand, light brown, slightly moist, firm, slightly cohesive.
		At 60 feet, clayey sand lens.
		At 67 feet, some consolidated shell nodules.
		At 63 feet, shell nodules interbedded.
		At 66 feet, color change to silvery gray.
		At 66-67 feet, clay lens with some sand, clay is cohesive, soft, sand is very fine-grained.
67-68	Sandy clay:	Some shell fragments, clay is slightly moist, moderately cohesive, sand is medium to coarse grained.
68-78	Sand:	Orange brown, slightly moist, medium grained, sand is loose, uniform.

TABLE A-4

LITHOLOGIC LOG OF MONITOR WELL MW-3 (Continued)

DEPTH INTERVAL (FEET)	DESCRIPTION OF MATERIAL
	At 69 feet, clay interbeds, with interspersed shell fragments, sand is slightly moist, stiff, dense.
	At 70 feet, sand is tan, micaceous.
	At 74 feet, sand is medium coarse, with fine shell fragments.
	At 75 feet, sand is saturated.
	At 76 feet, some clay nodules.
	At 77 feet, some shell fragments.
	At 77-78 feet, increased shell fragments.

TABLE A-5

LITHOLOGIC LOG OF MONITOR WELL MW-4

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-1	Fill:	Asphalt, bricks, in clay matrix.
1-4	Clay:	Dark brown, very slightly moist, very stiff, very cohesive.
4-10	Sandy clay:	Medium brown, slightly moist, sand is very fine grained, clay is firm, moderately cohesive.
		At 6 feet, striated lenses, dark brown, yellow, orange.
		At 6-10 feet, increasing sand content.
10-18	Clay:	Brown, slightly moist, trace of sand, sand is very fine grained, clay is moderately cohesive.
		At 17 feet, clay is moist.
18-19	Clay/sandy clay:	Clay is looser, sand is fine grained.
19-21	Clay/sandy clay:	Traces of gravel.
21-23	Sandy clay:	Light brown, slightly moist, moderately cohesive, sand is fine-grained.
23-25	Sandy clay/ clayey sand:	Reddish brown, interbedded clay lenses.
25-26	Clayey sand/ sand:	Reddish brown, slightly moist, sand is fine grained.
26-37	Sand:	Dry, very fine grained, loose, trace of clay.
		At 31 feet, more tan in color.

TABLE A-5

LITHOLOGIC LOG OF MONITOR WELL MW-4 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
		At 34 feet, sand slightly coarser.
		At 36 feet, dry, loose sand.
37-38	Sand:	Light gray, cemented, abundant shell fragments.
38-41	Clayey sand:	Tan, cemented, shell fragments.
41-42	Clay sand:	Brown, clay is moist, sand is fine grained, shell fragments, interbeds of sandy clay.
45-50	Sand:	Reddish brown, dry, medium grained, loose.
		At 47 feet, sand is lighter in color.
		At 48 feet, some oxidized masses.
50-55	Sand:	Reddish brown, slightly moist, loose, medium grained, occasional cemented fragments.
		At 51 feet, small clay nodules.
55-64	Sand:	Same as above with indurated clay masses.
		At 57 feet, small clay nodules, sand is grayish brown, sand is medium grained.
		At 58 feet, indurated cobble-size clay nodules.
		At 60 feet, small clay nodules.
		At 61 feet, interbeds of red sand.
64-67	Sand:	Reddish brown, slightly moist, medium grained, loose, occasional cemented fragments.
67-69	Clayey sand/ sand:	Gray, moist, loose, clay nodules, sand is medium fine-grained.

TABLE A-5

LITHOLOGIC LOG OF MONITOR WELL MW-4 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
69-76	Sand:	Gray, moist to wet, loose, fine grained.
		At 71 feet, sand is wet.
		At 72 feet, some clay.
		At 73 feet, some clay interbeds.
		At 75 feet, sand is saturated.
		At 76 feet, sand is coarser grained.

TABLE A-6

LITHOLOGIC LOG OF MONITOR WELL MW-5

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-1	Fill:	Aggregate, gravel in sand matrix.
1-3	Clay:	Some sand, dark brown, slightly moist, very stiff, very cohesive.
3-9	Sandy clay:	Medium brown, slightly moist, firm, moderately cohesive, sand is very fine grained.
		At 4-9 feet, becomes sandier, lighter brown.
9-11	Clayey sand:	Light brown, slightly moist, firm, slightly cohesive, sand is fine grained.
11-29	Clayey sand:	Light yellow brown, slightly moist, loose, sand is fine grained, clay is moderately cohesive.
		At 16 feet, occasional very thin, light orange clay lenses.
		At 24 feet, slightly dense.
		At 29 feet, some clay.
29-43	Sand:	Light yellow brown, slightly moist, loose, sand is very fine grained, very uniform.
		At 29-31 feet, shell fragments.
		At 39 feet, occasional very well cemented sand.
		At 41 feet, occasional very well cemented sand.
43-47	Sand:	Light orange brown, slightly moist, interbedded loose and very well cemented, sand is fine to medium grained.

TABLE A-6

LITHOLOGIC LOG OF MONITOR WELL MW-5 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
47-52	Sand:	Light orange brown, dry, well cemented, sand is fine grained, interbedded shell fragments, occasional clay nodules.
52-63	Sand:	Light yellow brown, slightly moist, loose, sand is very fine grained, uniform.
		At 58 feet, moist.
		At 59 feet, some orange staining.
		At 62 feet, increasing clay.
63-70	Clay/sandy Clay:	Red brown with orange staining, slightly moist, firm, moderately cohesive. Sand is tan, slightly moist, loose, fine grained.
		At 67 feet, slightly sweet odor, increasing moisture content.
		At 68 feet, occasional dense sand.
		At 70 feet, saturated sand.
70-72	Sand:	Tan, saturated, loose, fine grained, very uniform.

TABLE A-7

LITHOLOGIC LOG OF SOIL BORING S-101

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-17	Fill:	Asphalt fragments, cement, wood, wire in dark brown sandy clay matrix, no odor.
17-18	Fill:	Purplish-gray, sandy matrix, brick and concrete fragments.
18-23	Clay:	Pale gray, slightly moist, highly odiferous, cohesive, trace of sand.
23-25	Sandy clay:	Gray, slightly moist, cohesive, sand is fine grained, purple concretions.
25-30	Sand:	Yellowish, slightly moist, loose, interbedded with limey material, purple stains.
		At 26 feet, increasing clay.
		At 30 feet, contact with native material (?).
30-37	Sand:	Light brown, slightly moist, medium grained, loose, sand still contains some purple staining, highly odiferous.
		At 35 feet, decreasing purple stains.
		At 36 feet, increasing purple stains, highly odiferous.
37-40	Sand:	Well cemented, extremely hard, odiferous, contains nodules of hard indurated black-stained clay, numerous shell fragments.
40-45	Sand:	Brown, slightly moist, medium grained, contains shell fragments, intermittent purple stain.
		At 41 feet, well cemented shell fragments, intermittent purple stain.
		At 42 feet, well cemented, very hard.

TABLE A-7

LITHOLOGIC LOG OF SOIL BORING S-101 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
45-50	Sand:	Brown, slightly moist, loose, uniform, medium grained, odiferous.
		At 47 feet, sand is yellowish brown in color.
		At 48 feet, occasional cohesive clay nodules.
		At 50 feet, sand is uniform, yellow brown, medium grained, odiferous.

TABLE A-8

MONITOR WELL CONSTRUCTION DATA

WELL IDENTIFIER	DATE DRILLED	DEPTH OF WELL (FEET)[1]	PERFORATED INTERVAL (FEET)	TOP OF SAND PACK (FEET)	LAND SURFACE ELEVATION (FEET, amsl)	REFERENCE POINT ELEVATION (FEET, amsl)[2]
MW-1	4-26-85	76.6	63.0-73.0	57.5	42.84	42.77
MW-2	4-27-85	77.5	66.7-76.7	59.7	49.43	48.77
MW-3	4-26-85	75.0	64.4-74.4	55.9	47.50	47.66
MW-4	4-26-85	75.3	64.9-74.9	56.7	46.89	47.08
MW-5	4-25-85	72.4	61.5-72.5	55.0	45.36	45.16

NOTE: Unless otherwise noted, all measurements refer to feet below land surface. Land surface elevations are referenced to City of Los Angeles elevation grid.

1 Indicates drilled depth. In some cases, caving was severe and prevented placing of casing to bottom of hole.

2 Reference point is top of PVC casing; amsl - above mean sea level.

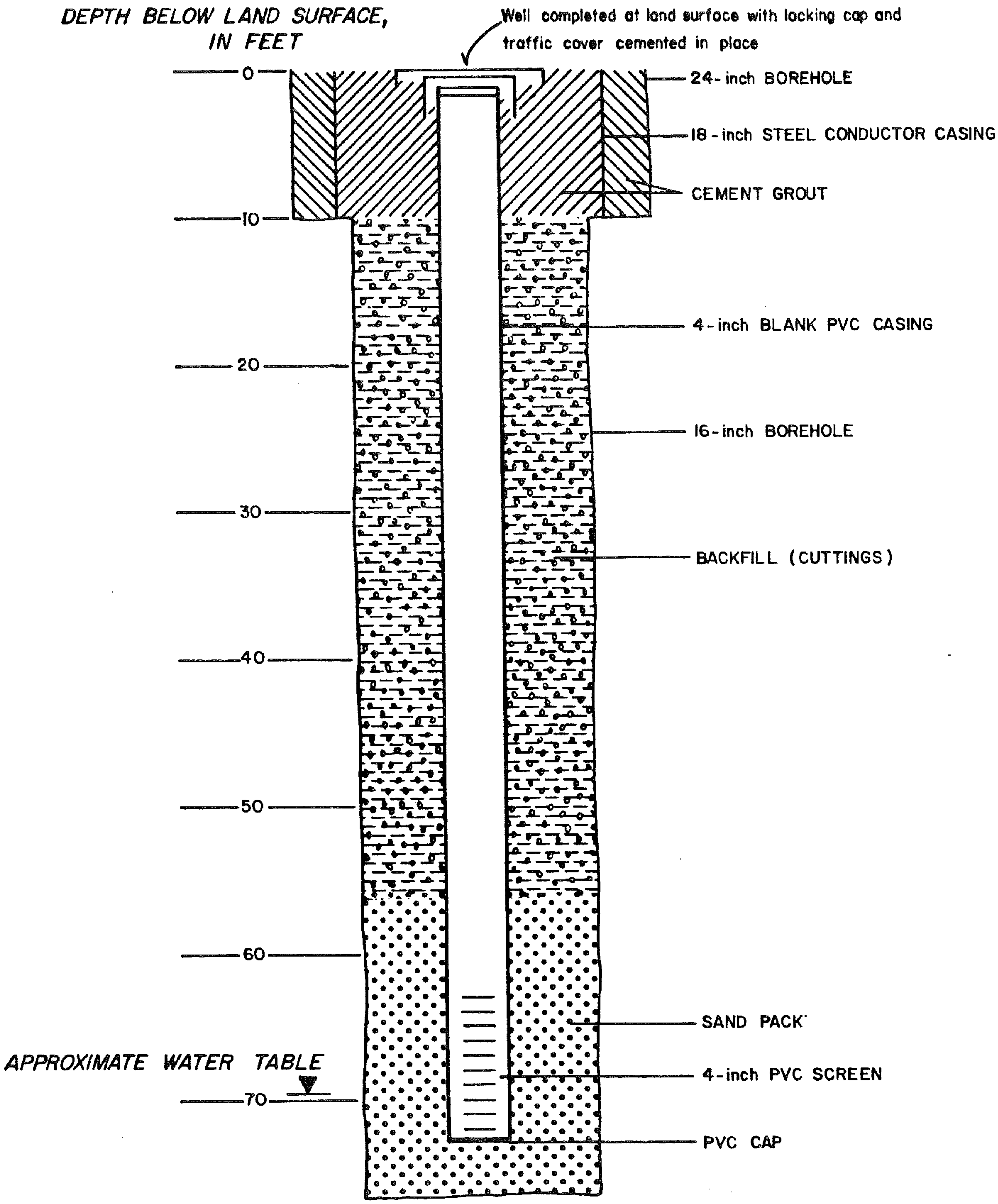


FIGURE A-1. SCHEMATIC CONSTRUCTION DIAGRAM OF MONITOR WELL MW-1

HARGIS + ASSOCIATES, INC.

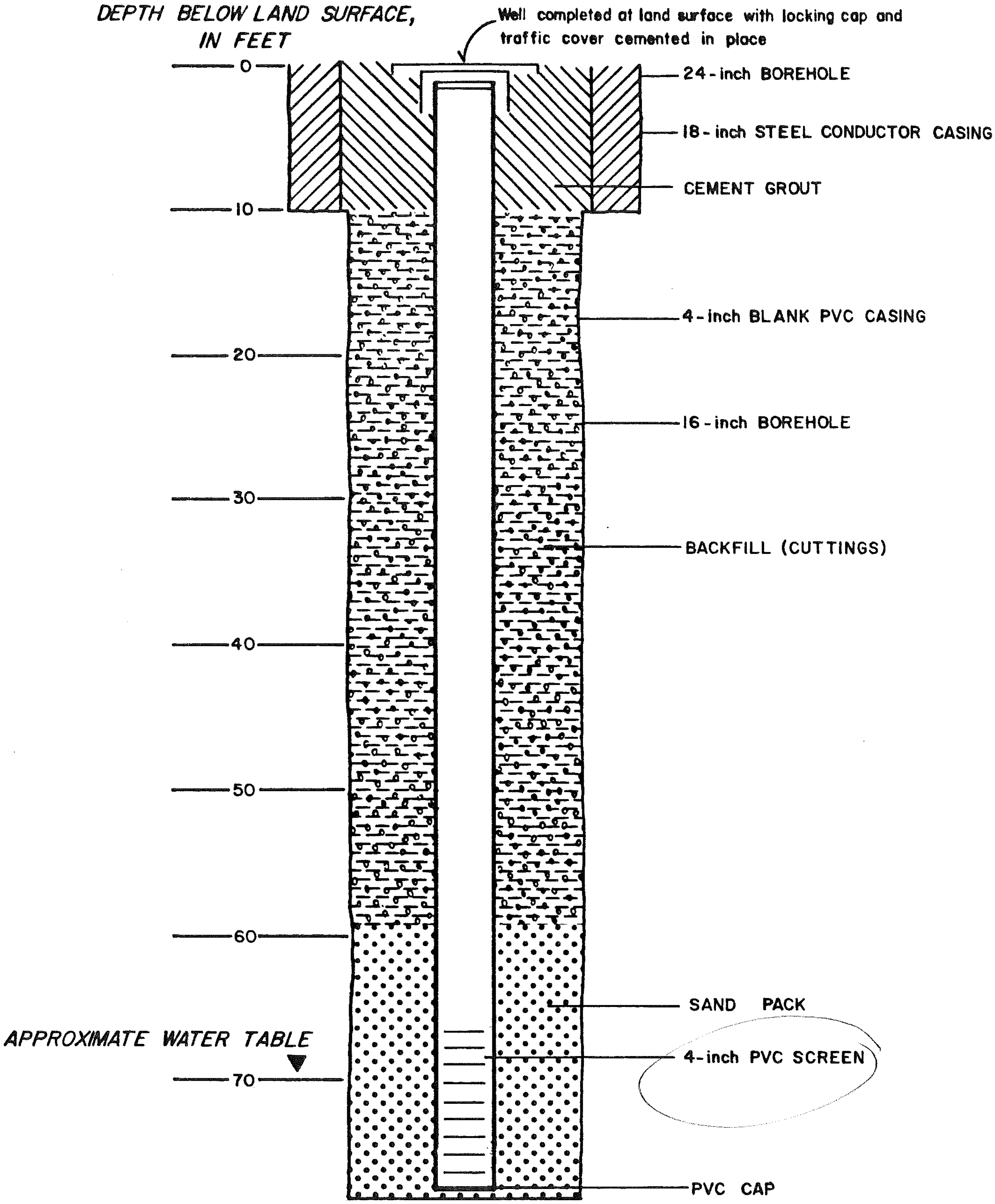


FIGURE A-2. SCHEMATIC CONSTRUCTION DIAGRAM OF MONITOR WELL MW-2

HARGIS + ASSOCIATES, INC.

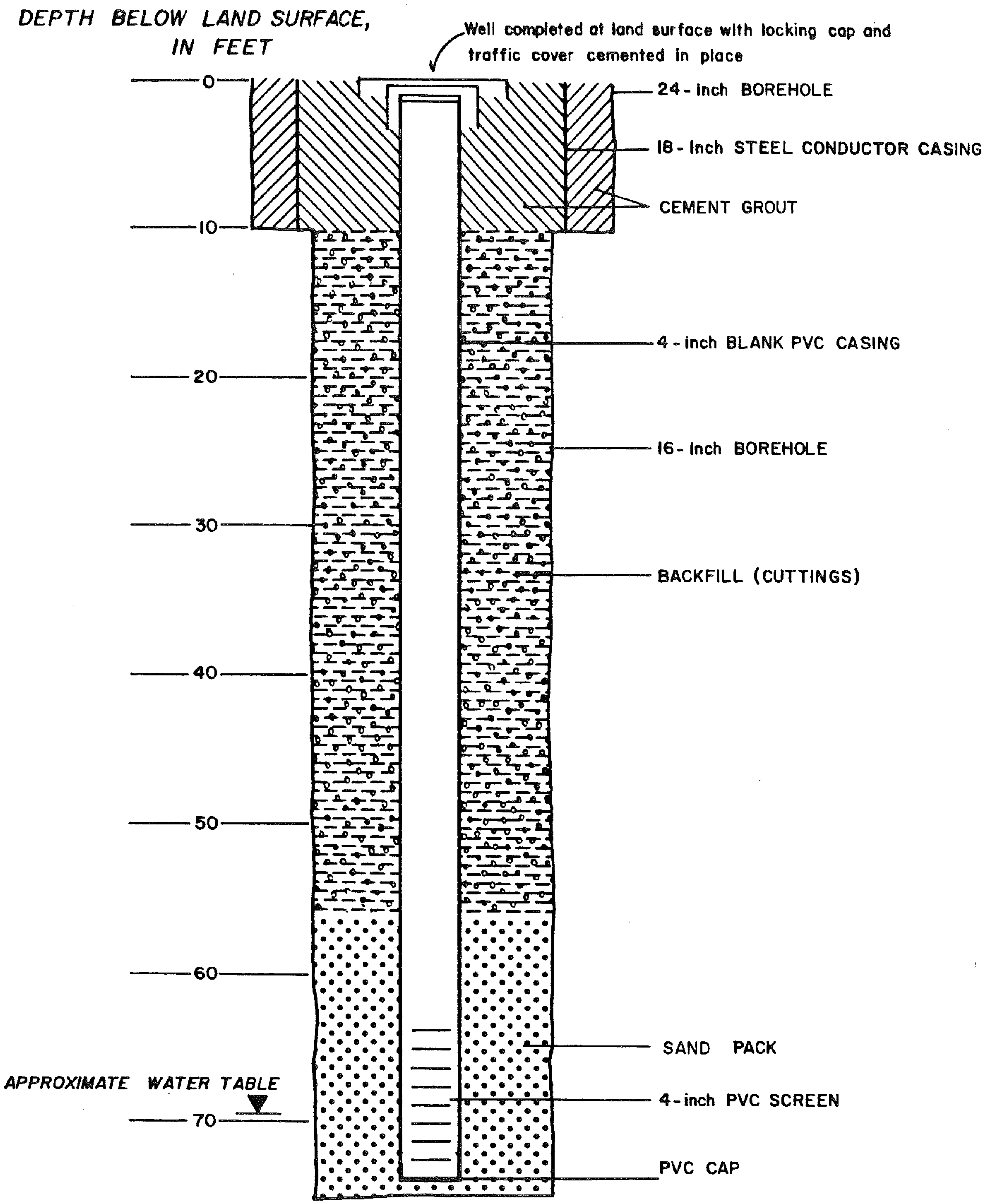


FIGURE A-3. SCHEMATIC CONSTRUCTION DIAGRAM OF MONITOR WELL MW-3

HARGIS + ASSOCIATES, INC.

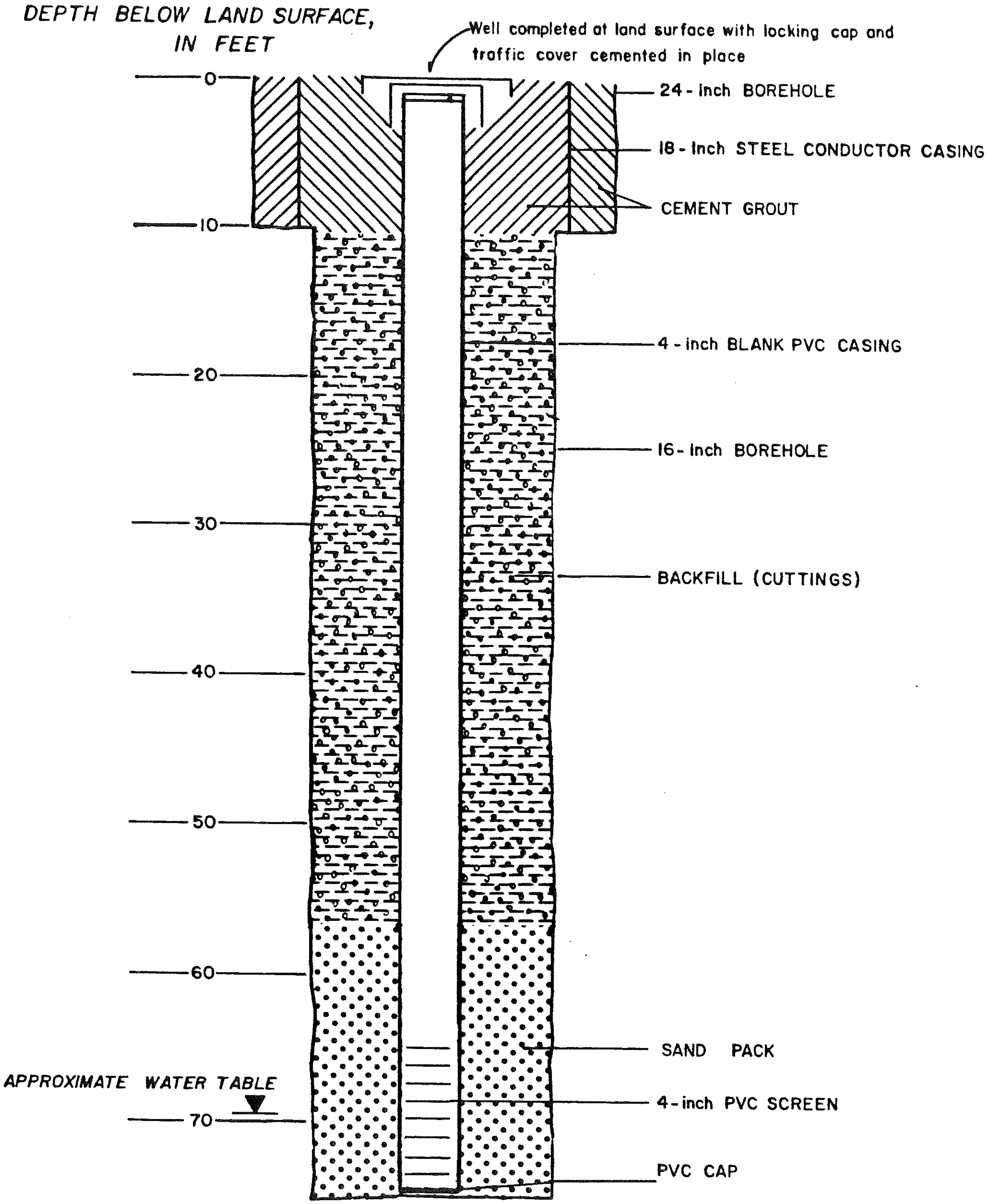


FIGURE A-4. SCHEMATIC CONSTRUCTION DIAGRAM OF MONITOR WELL MW-4

HARGIS + ASSOCIATES, INC.

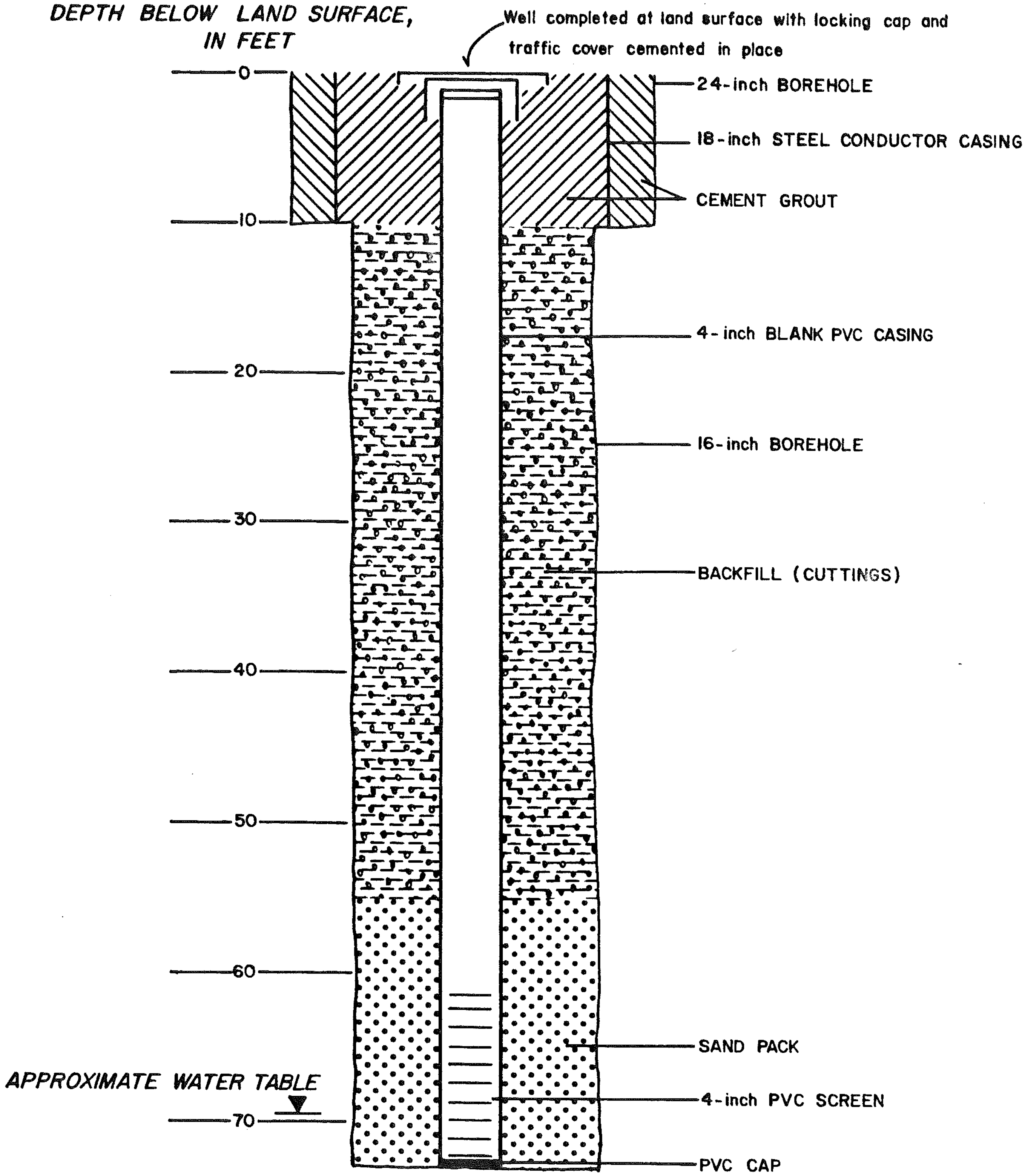


FIGURE A-5. SCHEMATIC CONSTRUCTION DIAGRAM OF MONITOR WELL MW-5

HARGIS + ASSOCIATES, INC.

APPENDIX B

APPENDIX B

SOIL SAMPLE COLLECTION AND DOCUMENTATION

SOIL SAMPLE COLLECTION AND DOCUMENTATION

Soil samples were collected during the drilling of the five monitor wells and one soil boring **(Figure 2)**. All soil samples were collected using Shelby-type split-tube samplers driven into the formation by the weight of the Kelly bar on the bucket auger rig. Soil samples were collected at five-foot intervals except in the case of soil boring S-101, where initial samples were collected at the base of the fill material placed in the former wastewater impoundment area.

SOIL SAMPLE COLLECTION PROCEDURE

Two split-tube samplers were used during the drilling of each monitor well and the soils boring. The samplers were prepared for each sampling run by disassembling them, washing each part thoroughly, and rinsing in distilled water. Six-inch and eighteen-inch brass tubes were used for collection of the soil sample to be analyzed by the laboratory. These tubes were prepared by thoroughly washing them in clean water and Dawn liquid detergent, and rinsing in distilled water. The tubes, along with their end caps, were then placed in a sealed plastic bag in an ice chest with ice until ready for use.

Each split-tube sampler was assembled just prior to the sampling run. Either three six-inch brass tubes or one eighteen-inch brass tube was placed in the sampler body above the tube used to collect the sample for analysis. The sampler was then assembled and attached to the Kelly bar for collection of the sample. After each tube was retrieved, the six-inch brass tube containing the sample to be analyzed was carefully removed from the sampler. Teflon sheets were placed over the ends of the tubes and held in place by plastic end caps. The end caps were secured using electrician's tape. Each sample was labeled with the hole number, date, and depth interval in indelible ink, and then placed in individual sealed plastic bags. The samples were then placed in an ice chest filled with ice.

Soil samples from the remaining three six-inch tubes or eighteen-inch tube were examined and described in the lithologic log **(Tables A-1 to A-7)**. A portion of the soil sample was placed in a sealed plastic bag, labeled, and stored for future reference.

The three remaining six-inch tubes or the eighteen-inch tube were then washed, rinsed and allowed to air-dry.

At the end of each sampling day, all soil samples were placed in a large ice chest filled with ice, along with a letter of transmittal and chain-of-custody document, and prepared for shipment to the laboratory. The ice chest was sealed with tape and labeled. All soil samples were shipped to the laboratory within 24 hours of collection. Trip blanks collected at a location two miles north of the site were included in each shipment of soil samples sent to the laboratory. Each trip blank was obtained using a hand sampler and six-inch brass tube. The trip blanks were labeled, handled and stored in a manner identical to the on-site soil samples.

All soil samples were analyzed by Brown and Caldwell Analytical Laboratories, Pasadena, California.

APPENDIX C

APPENDIX C

RESULTS OF SOIL ANALYSES

TABLE C-1

RESULTS OF CHEMICAL ANALYSES OF SOIL SAMPLES COLLECTED FROM MONITOR WELL MW-1

Sample Depth (ft)	Results in Milligrams per Kilogram		
	Chlorobenzene	Tetrachloroethylene	Total DDT
6.0 - 6.5	<0.3	---	<0.6
11.0 - 11.5	<0.3	---	<0.6
16.5 - 17.0	<0.3	<0.3	<0.6
21.5 - 22.0	<0.3	<0.3	<0.6
26.5 - 27.0	<0.3	1.0	<0.6
31.5 - 32.0	<0.3	<0.3	<0.6
36.5 - 37.0	<0.3	<0.3	<0.6
41.5 - 42.0	0.3	1.0	<0.6
46.5 - 47.0	<0.3	<0.3	<0.6
51.5 - 52.0	<0.3	<0.3	<0.6
56.5 - 57.0	2.0	<0.3	<0.6
56.5 - 57.0 (Dup)	0.9	<0.3	<0.6
61.5 - 62.0	0.3	<0.3	<0.6
66.5 - 67.0	0.6	0.6	<0.6
71.5 - 72.0	1.0	0.9	<0.6
76.5 - 77.0	0.6	<0.3	<0.6

Analyses performed by Brown & Caldwell, Pasadena, California.

TABLE C-2

RESULTS OF CHEMICAL ANALYSES OF SOIL SAMPLES
COLLECTED FROM MONITOR WELL MW-2

Sample Depth (ft)	Results in Milligrams per Kilogram		
	Chlorobenzene	Tetrachloroethylene	Total DDT
6.0 - 6.5 2A	70	<0.3	2257
6.0 - 6.5	<0.3	<0.3	<0.6
11.0 - 11.5	<0.3	<0.3	1721
16.5 - 17.0	4.0	---	1276.5
21.5 - 22.0	6.0	---	119.3
26.5 - 27.0	160	---	3724.2
31.5 - 32.0	23.0	---	1304.64
36.5 - 37.0	14.0	---	6.35
41.5 - 42.0	1.0	---	2.0
46.5 - 47.0	96	---	801.96
51.5 - 52.0	420	---	997.85
56.5 - 57.0	38	---	153.07
61.5 - 62.0	4100	---	8616.9
66.5 - 67.0	590	---	1151.45
71.5 - 72.0	200	---	772.99
76.5 - 77.0	7400	---	4977.5

Analyses performed by Brown & Caldwell, Pasadena, California.

TABLE C-3

RESULTS OF CHEMICAL ANALYSES OF SOIL SAMPLES COLLECTED FROM MONITOR WELL MW-3

Sample Depth (ft)	Results in Milligrams per Kilogram		
	Chlorobenzene	Tetrachloroethylene	Total DDT
6.0 - 6.5	---	---	7.45
11.0 - 11.5	---	---	<0.6
16.5 - 17.0	<0.3	<0.3	<0.6
16.5 - 17.0 (Dup)	<0.3	<0.3	<0.6
21.5 - 22.0	<0.3	<0.3	<0.6
26.5 - 27.0	<0.3	<0.3	<0.6
31.5 - 32.0	<0.3	<0.3	<0.6
36.5 - 37.0	<0.3	<0.3	<0.6
41.5 - 42.0	<0.3	<0.3	<0.6
46.5 - 47.0	<0.3	<0.3	<0.6
51.5 - 52.0	0.6	<0.3	<0.6
56.5 - 57.0	9.0	---	1.76
61.5 - 62.0	6.0	---	1.51
66.5 - 67.0	24.0	---	3.39
71.5 - 72.0	2.0	---	0.35
76.5 - 77.0	1.0	---	0.37

Analyses performed by Brown & Caldwell, Pasadena, California.

TABLE C-4

RESULTS OF CHEMICAL ANALYSES OF SOIL SAMPLES
COLLECTED FROM MONITOR WELL MW-4

Sample Depth (ft)	Results in Milligrams per Kilogram		
	Chlorobenzene	Tetrachloroethylene	Total DDT
6.0 - 6.5	---	---	<0.6
11.0 - 11.5	---	---	<0.6
16.5 - 17.0	<0.3	<0.3	<0.6
21.5 - 22.0	<0.3	<0.3	<0.6
26.5 - 27.0	<0.3	<0.3	<0.6
31.5 - 32.0	<0.3	<0.3	<0.6
31.5 - 32.0 (Dup)	0.6	0.3	<0.6
36.5 - 37.0	<0.3	<0.3	<0.6
42.5 - 43.0	<0.3	<0.3	<0.6
46.5 - 47.0	---	---	<0.6
51.5 - 52.0	---	---	<0.6
56.5 - 57.0	---	---	<0.6
61.5 - 62.0	---	---	<0.6
66.5 - 67.0	---	---	<0.6
71.5 - 72.0	---	---	<0.6
76.5 - 77.0	<0.3	---	<0.6

Analyses performed by Brown & Caldwell, Pasadena, California.

TABLE C-5

RESULTS OF CHEMICAL ANALYSES OF SOIL SAMPLES COLLECTED FROM MONITOR WELL MW-5

Sample Depth (ft)	Results in Milligrams per Kilogram		
	Chlorobenzene	Tetrachloroethylene	Total DDT
6.0 - 6.5	---	---	<0.6
11.0 - 11.5	---	---	<0.6
16.5 - 17.0	<0.3	<0.3	<0.6
21.5 - 22.0	<0.3	<0.3	<0.6
26.5 - 27.0	<0.3	<0.3	<0.6
31.5 - 32.0	<0.3	<0.3	<0.6
36.5 - 37.0	<0.3	<0.3	<0.6
41.5 - 42.0	0.3	0.6	<0.6
46.5 - 47.0	---	<0.3	<0.6
51.5 - 52.0	---	<0.3	<0.6
56.5 - 57.0	---	0.3	<0.6
65.0 - 65.5	---	<0.3	<0.6
65.0 - 65.5 (Dup)	---	0.3	<0.6
71.5 - 72.0	---	<0.3	<0.6

Analyses performed by Brown & Caldwell, Pasadena, California.

TABLE C-6

RESULTS OF CHEMICAL ANALYSES OF SOIL SAMPLES COLLECTED FROM SOIL BORING S-101

Results in Milligrams per Kilogram

Sample Depth (ft)	Chlorobenzene	Tetrachloroethylene	Trichloroethylene	1,2-Dichloroethylene	Total DDT
22.5 - 23.0	190	2.0	0.6	0.9	6131
26.5 - 27.0	1200	<3.0	-	<3	1.55
31.5 - 32.0	3400	<30.	-	30	4175.6
36.5 - 37.0	3500	<30.	-	<30	9406.2
41.5 - 42.0	3800	<6.0	-	<30	12,621
46.5 - 47.0	1800	<6.0	-	<6	3247.7
51.5 - 52.0	2900	-	-	<6	5019.7

Analyses performed by Brown & Caldwell, Pasadena, California.

APPENDIX D

APPENDIX D

QUALITY ASSURANCE

QUALITY ASSURANCE

The objective of the Quality Assurance Program is to provide data for which the limits of uncertainty are known, and from which confident conclusions may be drawn. Proper documentation provides records of traceability and assurance of adherence to prescribed protocols.

The Quality Assurance Program established for this investigation contains complete documentation records of all sampling activities, including: field measurements and calibration of instruments; sampling techniques; preservation procedures; sample integrity documentation (blanks, splits, and duplicates); chain-of-custody records; packaging, shipping and handling procedures; analytical methods; and laboratory quality control procedures.

FIELD MEASUREMENTS AND CALIBRATION OF EQUIPMENT

Field equipment used to perform various measurements during this investigation included a steel tape and sounder for measuring water levels, a YSI Model 33 conductivity meter for measuring electrical conductivity of water samples, a Conning Model 103 pH meter for measuring pH, and a field thermometer.

All water levels were measured with a calibrated two-conductor sounder or steel tape. The sounder was calibrated with the steel tape prior to beginning field measurements. The steel tape was inspected for breaks or bends. Both the sounder and steel tape were rinsed in distilled water before each measurement.

The probes on the conductivity meter and pH meter were rinsed in distilled water prior to use. The pH meter was calibrated in a standard solution prior to use. The water sample for which pH and electrical conductivity were determined was not used to fill sample containers. All manufacturer's instructions for use of the instruments were followed.

SAMPLING TECHNIQUES

The soil and water sampling techniques used in this investigation are documented in separate sections of this report. Each procedure is a standard and accepted method of sampling soil and water as described in Scalf and Others (1981), and other references.

SAMPLE PRESERVATION

All soil and water samples, except water samples for common ions, were stored in ice chests, packed in ice, and transported to the laboratory within 24 hours of collection. The ice chests were sealed with tape. Transmittal letters, chain-of-custody documents, and lab schedules were sealed in two zip-lock bags inside the ice chests.

SAMPLE INTEGRITY

Each shipment of water samples contained a blank water sample of distilled water. The blank was collected in a 40 ml vial, sealed, labeled, packed and stored in a manner identical to the other water samples collected. The identity of the blank water sample was unknown to the laboratory performing the analysis.

Duplicate water samples for analysis of volatile organic compounds and pesticides were included in each sampling round. The duplicates were collected, sealed, labeled, packed and stored in a manner identical to the other water samples collected. The identity of the duplicate water samples was unknown to the laboratory performing the analysis.

Each shipment of soil samples contained a trip blank soil sample consisting of soil from a remote location. The blank soil sample was collected, sealed, labeled, packed and stored in a manner identical to the other soil samples collected. The identity of the trip blank soil samples were unknown to the laboratory performing the analysis.

Duplicate soil samples were prepared by the laboratory for approximately 10 percent of the soil samples.

SAMPLE HANDLING, PACKAGING, SHIPMENT AND CHAIN-OF-CUSTODY

Each water sample was labeled in the field with the well number, date and time of sampling, collector's name and company, and the analysis to be performed. Sample container lids were secured with electrician's tape. All pertinent data concerning each sample were recorded in a field log book. The sample was immediately placed in an ice chest on ice, and remained in the custody of the sample collector until transport to the laboratory. Letters of transmittal, chain-of-custody documentation, and laboratory schedules for analysis to be performed were prepared at the end of each sampling event, and sealed inside each shipment to the laboratory. Water samples were transported to the laboratory by vehicle at the end of each sampling day.

APPENDIX E

APPENDIX E

LABORATORY QUALITY ASSURANCE

BROWN AND CALDWELL
ANALYTICAL LABORATORIES

June 11, 1985

Mr. Terry Turner
Hargis & Associates
2222 South Dobson Road, Suite 401
Mesa, Arizona 85202

Dear Mr. Turner:

This letter will serve to document the methodologies, quality control practices and chain-of-custody procedures followed in analyzing five groups of soil samples and one group of water samples taken from Torrance, California. The samples were collected on April 24-27, and May 1-2, 1985, and are designated as in Table 1.

The following analytical methods were employed:

Parameter	Soil	Water
Volatile Oranics (Table 2)	EPA 8240 (1)	EPA 624 (2)
Organochlorine Pesticides (Table 3)	EPA 8080 (1)	EPA 608 (2)
Chloral	EPA 3550/8015 (1)	EPA 3510/ 8015 (1)
Semi-volatile Organics (Table 4)	--	EPA 625 (2)

Citations:

(1) "Test Methods for Evaluating Solid Waste", SW-846, 2nd Edition, U.S.E.P.A., July 1982.

(2) Federal Register, December 3, 1979.

Volatile organics are analyzed by EPA method 8240 (soils) or method 624 (waters), involving purge and trap GC/MS using a packed column.

The organochlorine pesticides are analyzed according to EPA method 8080 (soils) or 608 (waters), using GC separation with electron capture detector. The identities of substances detected on the first GC column are confirmed on a second column.

Chloral was detected by a modified EPA method 3550/8015 (soils) or a modified EPA 3510/8015 (waters) procedure. Solid samples were extracted using a sonication technique and analyzed by GC/ECD. Liquid samples were done by liquid-liquid extraction and GC/ECD analysis.

QUALITY ASSURANCE

Brown and Caldwell's quality control program follows guidelines established by the U.S.E.P.A. Sample control is managed by the Sample Control Officer. In addition to our computerized sample accounting system we implement a manual system and designate a secured refrigerator to store samples and extracts in enforcement cases. Analytical data are validated through rigorous quality control procedures. In addition to the analysis of field and method blanks and calibration standards, the analyst is required to run duplicates and spiked sample recoveries on 10 percent of all analyses to confirm validity of the method and to monitor precision and accuracy.

A complete description of Brown and Caldwell's Quality Control Program is appended as Attachment I.

If further details are required, please do not hesitate to contact us.

Very truly yours,

BROWN AND CALDWELL

Richard Amano
Laboratory Supervisor

RA:jm

TABLE 1

GROUP	B&C LOG NUMBER	SAMPLE DESCRIPTION	DATE SAMPLED
1	P85-04-310-1	SOIL, MW-1 6.0-6.5'	04/24/85
1	P85-04-310-2	SOIL, MW-1 11.0-11.5'	04/24/85
1	P85-04-310-3	SOIL, MW-2A 6.0-6.5'	04/24/85
1	P85-04-310-4	SOIL, MW-2 6.0-6.5'	04/24/85
1	P85-04-310-5	SOIL, MW-2 11.0-11.5'	04/24/85
1	P85-04-310-6	SOIL, MW-TBL 0-1'	04/24/85
1	P85-04-310-7	SOIL, MW-3 6.0-6.5'	04/24/85
1	P85-04-310-8	SOIL, MW-3 11.0-11.5'	04/24/85
1	P85-04-310-9	SOIL, MW-4 6.0-6.5'	04/24/85
1	P85-04-310-10	SOIL, MW-4 11.0-11.5'	04/24/85
1	P85-04-310-11	SOIL, MW-5 6.0-6.5'	04/24/85
1	P85-04-310-12	SOIL, MW-5 11.0-11.5'	04/24/85
2	P85-04-337-1	SOIL, MW-1 16.5-17.0'	04/25/85
2	P85-04-337-2	SOIL, MW-1 21.5-22.0'	04/25/85
2	P85-04-337-3	SOIL, MW-1 26.5-27.0'	04/25/85
2	P85-04-337-4	SOIL, MW-1 31.5-32.0'	04/25/85
2	P85-04-337-5	SOIL, MW-1 36.5-37.0'	04/25/85
2	P85-04-337-6	SOIL, MW-1 41.5-42.0'	04/25/85
2	P85-04-337-7	SOIL, MW-1 46.5-47.0'	04/25/85
2	P85-04-337-8	SOIL, MW-1 51.5-52.0'	04/25/85
2	P85-04-337-9	SOIL, MW-1 56.5-57.0'	04/25/85
2	P85-04-337-10	SOIL, MW-1 56.5-57.0' DUP	04/25/85
2	P85-04-337-11	SOIL, MW-1 61.5-62.0'	04/25/85
2	P85-04-337-12	SOIL, MW-1 66.5-67.0'	04/25/85
2	P85-04-337-13	SOIL, MW-5 16.5-17.0'	04/25/85
2	P85-04-337-14	SOIL, MW-5 21.5-22.0'	04/25/85
2	P85-04-337-15	SOIL, MW-5 26.5-27.0'	04/25/85
2	P85-04-337-16	SOIL, MW-5 31.5-32.0'	04/25/85
2	P85-04-337-17	SOIL, MW-5 36.5-37.0'	04/25/85
2	P85-04-337-18	SOIL, MW-5 41.5-42.0'	04/25/85
2	P85-04-337-19	SOIL, MW-5 46.5-47.0'	04/25/85
2	P85-04-337-20	SOIL, MW-5 51.5-52.0'	04/25/85
2	P85-04-337-21	SOIL, MW-5 56.5-57.0'	04/25/85
2	P85-04-337-22	SOIL, MW-5 65.0-65.5'	04/25/85
2	P85-04-337-23	SOIL, MW-5 65.0-65.5' DUP	04/25/85
2	P85-04-337-24	SOIL, MW-5 71.5-72.0'	04/25/85
2	P85-04-337-25	SOIL, MW TB2	04/25/85
3	P85-04-346-1	SOIL, MW-1 71.5-72.0'	04/26/85
3	P85-04-346-2	SOIL, MW-1 76.5-77.0'	04/26/85
3	P85-04-346-3	SOIL, MW-1 16.5-17.0'	04/26/85
3	P85-04-346-4	SOIL, MW-1 16.5-17.0' DUP	04/26/85
3	P85-04-346-5	SOIL, MW-1 21.5-22.0'	04/26/85
3	P85-04-346-6	SOIL, MW-1 26.5-27.0'	04/26/85
3	P85-04-346-7	SOIL, MW-3 31.5-32.0'	04/26/85
3	P85-04-346-8	SOIL, MW-3 36.5-37.0'	04/26/85
3	P85-04-346-9	SOIL, MW-3 41.5-42.0'	04/26/85
3	P85-04-346-10	SOIL, MW-3 46.5-47.0'	04/26/85
3	P85-04-346-11	SOIL, MW-3 51.5-52.0'	04/26/85

GROUP	B&C LOG NUMBER	SAMPLE DESCRIPTION	DATE SAMPLED
3	P85-04-346-12	SOIL, MW-4 16.5-17.0'	04/26/85
3	P85-04-346-13	SOIL, MW-4 21.5-22.0'	04/26/85
3	P85-04-346-14	SOIL, MW-4 26.5-27.0'	04/26/85
3	P85-04-346-15	SOIL, MW-4 31.5-32.0'	04/26/85
3	P85-04-346-16	SOIL, MW-4 31.5-32.0' DUP	04/26/85
3	P85-04-346-17	SOIL, MW-4 36.5-37.0'	04/26/85
3	P85-04-346-18	SOIL, MW-4 42.5-43.0'	04/26/85
3	P85-04-346-19	SOIL, MW-4 46.5-47.0'	04/26/85
3	P85-04-346-20	SOIL, MW-4 51.5-52.0'	04/26/85
3	P85-04-346-21	SOIL, MW-4 56.5-57.0'	04/26/85
3	P85-04-346-22	SOIL, MW-4 61.5-62.0'	04/26/85
3	P85-04-346-23	SOIL, MW-4 66.5-67.0'	04/26/85
3	P85-04-346-24	SOIL, MW-4 71.5-72.0'	04/26/85
3	P85-04-346-25	SOIL, MW-4 76.5-77.0'	04/26/85
3	P85-04-346-26	SOIL, MW-TB3	04/26/85
3	P85-04-346-27	WATER, MW-5	04/26/85
3	P85-04-346-28	SOIL, MW-1 78.0-78.5'	04/26/85
4	P85-04-348-1	SOIL, MW-2 16.5-17.0'	04/27/85
4	P85-04-348-2	SOIL, MW-2 21.5-22.0'	04/27/85
4	P85-04-348-3	SOIL, MW-2 26.5-27.0'	04/27/85
4	P85-04-348-4	SOIL, MW-2 31.5-32.0'	04/27/85
4	P85-04-348-5	SOIL, MW-2 36.5-37.0'	04/27/85
4	P85-04-348-6	SOIL, MW-2 41.5-42.0'	04/27/85
4	P85-04-348-7	SOIL, MW-2 46.5-47.0'	04/27/85
4	P85-04-348-8	SOIL, MW-2 51.5-52.0'	04/27/85
4	P85-04-348-9	SOIL, MW-2 56.5-57.0'	04/27/85
4	P85-04-348-10	SOIL, MW-2 61.5-62.0'	04/27/85
4	P85-04-348-11	SOIL, MW-2 66.5-67.0'	04/27/85
4	P85-04-348-12	SOIL, MW-2 71.5-72.0'	04/27/85
4	P85-04-348-13	SOIL, MW-2 76.5-77.0'	04/27/85
4	P85-04-348-14	SOIL, MW-3 TB4	04/27/85
4	P85-04-348-15	SOIL, MW-3 56.5-57.0'	04/27/85
4	P85-04-348-16	SOIL, MW-3 61.5-62.0'	04/27/85
4	P85-04-348-17	SOIL, MW-3 66.5-67.0'	04/27/85
4	P85-04-348-18	SOIL, MW-3	04/27/85
4	P85-04-348-19	SOIL, MW-3 76.5-77.0'	04/27/85
4	P85-04-348-20	WATER, MW-3	04/27/85
5	P85-05-044-1	SOIL, S-101 22.5-23'	05/01/85
5	P85-05-044-2	SOIL, S-101 26.5-27.0'	05/01/85
5	P85-05-044-3	SOIL, S-101 31.5-32.0'	05/01/85
5	P85-05-044-4	SOIL, S-101 36.5-37.0'	05/01/85
5	P85-05-044-5	SOIL, S-101 41.5-42.0'	05/01/85
5	P85-05-044-6	SOIL, S-101 46.5-47.0'	05/01/85
5	P85/05-044-7	SOIL, S-101 51.5-52.0'	05/01/85
5	P85-05-044-8	SOIL, S-101 TB6	05/01/85
6	P85-05-054-1	WATER, MW-1	05/02/85
6	P85-05-054-2	WATER, MW-2	05/02/85
6	P85-05-054-3	WATER, MW-4	05/02/85
6	P85-05-054-4	WATER, MW-4D	05/02/85
6	P85-05-054-5	WATER, MW-6B	05/02/85
6	P85-05-054-6	WATER, SP-1	05/02/85

TABLE 2

VOLATILE ORGANICS

Benzene	1,2-Dichlorobenzene	Ethyl benzene
Bromodichloromethane	1,3-Dichlorobenzene	Methylene chloride
Bromoform	1,4-Dichlorobenzene	Tetrachloroethene
Bromomethane	1,1-Dichloroethane	Toluene
Carbon Tetrachloride	1,2-Dichloroethane	Trichloroethane
Chlorobenzene	1,1-Dichloroethane	Vinyl chloride
Chloroethane	trans-1,2-Dichloroethane	Acrolein
2-Chloroethylvinyl ether	1,2-Dichloropropane	Acrylnitrile
1,1,1-Trichloroethane	Cis-1,3-Dichloropropene	Chloroform
1,1,2-Trichloroethane	Trans-1,3-Dichlorpropane	Chloromethane
Trichlorofluoromethane	1,1,2,2-Tetrachloroethane	Dibromochloromethane

TABLE 3

ORGANOCHLORINE PESTICIDES

o,p'-DDE	o,p'-DDD	o,p'-DDT
p,p'-DDE	p,p'-DDD	p,p'-DDT

TABLE 4

SEMI-VOLATILE ORGANICS

( )MPOUND

Acenaphthene
cenaphthylene
nthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
enzo(k)fluoranthene
enzo(a)pyrene
Benzo(ghi)perylene
enzidine
is(2-chloroethyl)ether
Bis(2-chloroethoxy)methane
is(2-ethylhexyl)phthalate
is(2-chloroisopropyl)ether
4-Bromophenyl phenyl ether
utyl benzyl phthalate
-Chloronaphthalene
-Chlorophenyl phenyl ether
Chrysene
ibenzo(a,H)anthracene
i-n-butylphthalate
1,3-Dichlorobenzene
,4-Dichlorobenzene
,2-Dichlorobenzene
3,3'Dichlorobenzidine

Diethylphthalate
Dimethylphthalate
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Di-n-octylphthalate
1,2-Diphenylhydrazine
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Hexachlorocyclopentadiene
Indeno(1,2,3-cd)pyrene
Isophorone
Naphthalene
Nitrobenzene
N-nitrosodimethylamine
N-nitrosodi-n-propylamine
N-nitrosodiphenylamine
Phenanthrene
Pyrene
1,2,4-Trichlorobenzene
4-Chloro-3-methylphenol
2-Chlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2-Methyl-4,6-dinitrophenol
2-Nitrophenol
4-Nitrophenol
Pentachlorophenol
Phenol
2,4,6-Trichlorophenol

ATTACHMENT D

QUALITY ASSURANCE AND CHAIN-OF-CUSTODY

Brown and Caldwell maintains a comprehensive quality assurance program based on guidelines established by the United States Environmental Protection Agency (USEPA)(a). Our program begins in the field where samples are collected and is carried through each step of the analytical process, report preparation, and final disposition of the samples.

SAMPLE COLLECTION

Advanced planning is essential to the collection of samples. Sampling equipment, appropriate containers, preservatives and holding times are a few of the considerations which must be made to minimize possibilities for contamination or unnecessary delays which threaten the integrity of the sample. Precision and accuracy are meaningless without the proper collection of a representative sample. Quality assurance starts out with our experienced field personnel. Sample bottles are clearly marked and all pertinent observations recorded along with sample description, time sampled, date sampled, and initials of the collector.

SAMPLE CONTROL

Verification of sample integrity is one of the main responsibilities of our sample control officer. The sample will be inspected to see that it was collected with the following considerations:

1. Sample identification - the sample must be clearly marked and dated.

2. The sample must be collected in the most appropriate container for the individual analysis, whether it be glass, plastic, or a special vial to avoid headspace.

3. The sample must be properly preserved.

4. There must be an adequate volume for all analyses involved.

If the above conditions are met, the sample will be given a log number and the description, date received, and client's name are all recorded along with any other relevant information. If aliquots or subsamples are to be split, care is taken to ensure that the subsamples are representative of the original. Blending or grinding may be required.

(a) U.S. Environmental Protection Agency Publication 600/4-79-020.

Another major task of the sample control officer is to establish a chain-of-custody. The sample must be accounted for from the time of collection to the time of disposal. Samples are normally held for 30 days after completion of the analyses; however, longer holding periods are negotiable.

ANALYTICAL

Brown and Caldwell's analytical quality control procedures require each set of analyses be accompanied by a number of control operations. The results of these data are compared against established norms in order to make sure the analyses is under control.

For example, the analysis of a set of six to ten wastewater samples for, say, ammonia would typically involve the following quality control measures.

- A three-to-four point calibration curve bracketing the concentrations of ammonia in the samples is constructed.
- A method (reagent) blank run is made.
- A laboratory control standard containing a known amount of the analyte in distilled water is determined daily.
- At least one replicate determination is made.
- At least one sample is spiked with a known amount of analyte and the percent recovery calculated.
- Wherever possible, a field blank is analyzed.
- A field replicate is analyzed if available.
- The method detection limit may be redetermined.

Results for the laboratory control and spike recovery samples are measured against norms established by prior laboratory experience. If either result differs from the expected value by more than three standard deviations, the method is said to be "out of control" - all work is stopped until the problem has been resolved. During the week following an "out-of-control" situation, quality control checks are made more frequently than the usual 10 to 15 percent.

Results are often confirmed by making use of an alternative method. For instance, calcium may be determined by atomic absorption, ion chromatography, or EDTA titrimetric methods. Volatile fatty acids may be determined by titration of a steam distillate or, with speciation, by gas, high determined by colorimetric, titrimetric, amperometric, or ion chromatographic methods.

Analytical performance is also monitored on a regular basis through the following:

1. Participation in the interlaboratory or round-robin programs

2. Participation in the USEPA'S check sample program

3. Analysis of internal blank check samples submitted by the quality assurance officer

4. Validation of data by analysis of samples by both Emeryville and Pasadena laboratories, independently

MISCELLANEOUS CHECKS OF ACCURACY

Wastewater analyses in particular often provide the analysts with unusual challenges such as interferences not discussed in the standard analytical reference manuals. Such difficulties, which would otherwise esscape detection, are often revealed by other frequently applied checks on accuracy. For example, an erroneously high sulfite value was found and corrected in the course of establishing a cation/anion balance.

Where applicable, correlations may be established for total organic carbon, biochemical oxygen demand, chemical oxygen demand, and other parameters. Dissolved solids and conductance often serve as checks against each other. Mass balance calculations will also assist in identifying error if flow rates of a system are known. All of the above considerations are essential to quality assurance in providing an added means of identifying error.

Where trace analysis is involved, purity of the water, solvents, reagents, and gases employed is of great concern. The highest quality chemicals appropriate for a particular analysis, including solvents especially prepared for pesticide analysis, are used throughout. A well-equipped dishwashing facility provides clean glassware. Glassware used in trace metal analysis is treated with aqua regia while organics glassware is dried in a muffle furnace at 500 degrees c after washing.

EQUIPMENT MAINTENANCE

Brown and Caldwell maintains service contracts on all major insrumentation, i.e., gas chromatographs, atomic abosrption, ion chromatography, and total organic carbon analyzers are all serviced and maintained regularly. Balances and spectrophotometers are also checked on a regular basis. Programmable calculators are provided to minimize the human error in repetitive calculations.

Chain-of-Custody

Brown and Caldwell's chain-of-custody procedures have been established to document the identity of a sample and its handling from the time of collection until its ultimate disposal.

Proper sample handling techniques begin with a well-planned sample collection program which includes having sample bottles precleaned and labeled. When sample bottles are requested by a client, they are appropriately prepared and preservatives added in advance. This assists in eliminating contamination or degradation of samples.

Sample identification is the field initiates a chain-of-custody record which is provided with the bottles and remains with the sample throughout its handling. This includes the transfer of samples from the field crew to the laboratory and, in some cases where necessary, to the subcontractors' laboratory.

Upon receipt at the laboratory, sample integrity is verified by the sample control officer as discussed above. Each sample is then assigned a discrete log number which will identify the sample recorded in the custody record and in the legally required sample log book maintained at Brown and Caldwell. When samples are received through a carrier, an acknowledgment of sample reception is immediately mailed to the client. However, arrangements are typically made to immediately contact the client by phone if problems are identified.

Generation of Reports

The sample control officer prepares a work sheet for each sample, based on information recorded in the sample log book. The work sheet is forwarded to the laboratory supervisor who schedules the work upon consultation with the appropriate section head. Upon completion, the results are recorded in a bound analysis log book and on the work sheet. The work sheet is then turned in for typing.

The typed copy is reviewed by both laboratory supervisor and laboratory manager before being sent out to the client. A copy of the results is filed along with the raw data which includes chromatograms, printouts, and quality control information. These are kept on file for a minimum of five years.

APPENDIX F

APPENDIX F

WATER SAMPLE COLLECTION AND DOCUMENTATION

WATER SAMPLE COLLECTION AND DOCUMENTATION

Groundwater samples were collected from the monitor wells in April and May 1985, and July 1-2, 1985.

SAMPLE COLLECTION

Groundwater samples were collected from all five monitor wells by bailing. The bailing equipment consisted of six-inch, one-foot, two-foot, or three-foot PVC bailers depending on the amount of standing water in the well. All bailers were two inches in diameter. The bailer used at each well was dedicated to that well, and not used to collect water samples from other wells. The bailing method consisted of lowering the bailer to the bottom of the well and then lifting it to land surface. Nylon twine was used to raise and lower each bailer. Prior to bailing, each bailer was thoroughly washed in clean water, rinsed in distilled water, and allowed to air dry. Large plastic sheets were spread around the wellhead to prevent contamination of the bailer or nylon line during bailing.

Three to five casing volumes of water were removed from the well prior to sample collection. Temperature and electrical conductivity of the bailed water were measured prior to sample collection. Both electrical conductivity and temperature remained stable during the bailing process on all monitor wells.

Bailed water not used to fill sample containers was placed in five-gallon buckets temporarily and later transferred to a sealed 55 gallon drum stored at the site.

Groundwater samples from all wells were analyzed for base/neutral and acid organics, pesticides including DDT, and volatile organic compounds including chlorobenzene. Groundwater samples from monitor wells MW-1, MW-2 and MW-4 were also analyzed for common ions including calcium, magnesium, sodium, potassium, carbonate, bicarbonate, chloride, sulfate, nitrate, fluoride, silica, electrical conductance, and total dissolved solids (residue at 180 degrees C).

HANDLING OF WATER SAMPLES

Samples for Common Ions

Water samples for analysis of common ions were collected in one-liter polyethylene bottles. The bottles were thoroughly rinsed with water bailed from the monitor well prior to sample collection. Temperature and electrical conductance were measured in the field at the time of the sampling.

Samples for Organic Compounds

Water samples for analysis of volatile organic compounds were collected in 40 ml glass vials with teflon-lined threaded caps. All vials were completely filled with water. The teflon liner is placed on the vial in such a manner as to expel any residual air. All water sample containers were taped, labeled and placed in an ice chest on ice until the analyses were performed.

Water samples for the analysis of organic base/neutral and acid compounds were collected in one-gallon amber colored glass bottles sealed with teflon-lined caps. The glass bottles were thoroughly rinsed with water bailed from the wells prior to the collection of the samples. All water sample containers were taped, labeled, and placed in ice chests on ice until the analyses were performed.

Samples for Pesticides

Water samples for analysis of pesticides were collected in one-liter amber colored glass bottles sealed with teflon-lined caps. The glass bottles were thoroughly rinsed with water bailed from the wells prior to the collection of the sample. All water sample containers were taped, labeled, and placed in ice chests on ice until the analyses were performed.

SHIPMENT OF WATER SAMPLES

Water samples for the analysis of base/neutral and acid organics, pesticides and volatile organic compounds were transported to Brown and Caldwell Analytical Laboratories, Pasadena, California, within 24 hours of collection in the field. All samples transported to Brown and Caldwell were stored in sealed ice chests on ice. Water samples for the analysis of common ions were shipped to BC Laboratories, Bakersfield, California, within three days of collection in the field.

APPENDIX G

APPENDIX G

COMMON IONS IN WATER SAMPLES

TABLE G-1

RESULTS OF CHEMICAL ANALYSES FOR ROUTINE CONSTITUENTS IN
WATER SAMPLES COLLECTED
APRIL AND MAY 1985, AND JULY 1985

CONSTITUENTS (milligrams per liter)	MONITOR WELL MW-1 APR - MAY	MW-1 JULY	MW-2 APR - MAY	MW-2 JULY	MW-4 APR - MAY	MW-4 JULY
Calcium	331	370	580	430	220	340
Magnesium	138	110	600	540	106	81
Sodium	455	840	2500	2500	210	220
Potassium	18	12	39	23	24	16
Carbonate	0	0	0	0	0	0
Bicarbonate	680	760	582	570	392	680
Chloride	616	670	1919	2100	680	610
Sulfate	980	900	5440	3600	165	100
Nitrate	-0.4	.71	0.9	.92	52.3	110
Fluoride	0.27	NA	6.8	5.7	0.14	.12
Boron	0.94	NA	0.97	NA	0.74	NA
Silica	38	NA	36	NA	40	NA
TDS @ 180°F	2920	3280*	13740	9480*	2010	1810*
EC @ 25°C	4400	3900	NA	14,000	3100	3200
pH (lab)	7.7	6.4	7.2	5.8	7.2	6.5
Temperature, °C						
Laboratory	B&C	B&C	B&C	B&C	B&C	B&C

TRACE METALS (milligrams per liter)	MW-1 APR - MAY	MW-1 JULY	MW-2 APR - MAY	MW-2 JULY	MW-4 APR - MAY	MW-4 JULY
Antimony	NA	NA	NA	NA	NA	NA
Arsenic	-0.01	NA	-0.01	NA	-0.01	NA
Barium	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA
Chromium (total)	NA	NA	NA	NA	NA	NA
Chromium (hexavalent)	NA	NA	NA	NA	NA	NA
Copper	-0.01	-0.09	-0.02	-0.09	-0.01	-0.09
Cyanide	NA	NA	NA	NA	NA	NA
Iron	0.08	-0.1	0.07	4.2	-0.05	-0.1
Lead	NA	NA	NA	NA	NA	NA
Manganese	1.8	1.5	35	35	-0.01	.33
Mercury	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA
Strontium	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA
Zinc	0.02	-0.02	0.17	0.37	-0.01	-0.02
Laboratory	B&C	B&C	B&C	B&C	B&C	B&C

(-) = Less than   NA = Not Analyzed

* Based on the sum of the ions (Hem, 1970)

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APPENDIX H

APPENDIX H

VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER SAMPLES

TABLE H-1
CONCENTRATION OF VOLATILE ORGANIC COMPOUNDS, INCLUDING THE EPA VOLATILE PRIORITY POLLUTANTS, IN WATER SAMPLES COLLECTED IN APRIL AND MAY 1985, AND JULY 1985

VOLATILE ORGANIC COMPOUNDS (micrograms per liter)	MONITOR WELL MW-1 APR - MAY	MW-1 JULY	MW-2 APR - MAY	MW-2 JULY	MW-3 APR - MAY	MW-4 APR - MAY	MW-4 JULY	MW-5 APR - MAY
Acrolein	- 10	- 100	- 500	- 500	- 10	- 50	- 50	-250
Acrylonitrile	- 10	- 100	- 500	- 500	- 10	- 50	- 50	-250
Benzene	660	3200	- 50	150	40	- 5	- 5	1100
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND
Bromoethane	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	14	ND	- 50	- 50	16	10	25	180
Chlorobenzene	1400	15,000	54,000	180,000	59	850	160	93,000
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	1100	1600	5800	5600	760	3100	4700	24,000
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	3	ND	- 50	ND	ND	- 5	ND	ND
1,2-Dichloroethane	3	ND	150	150	ND	- 5	- 5	ND
1,1-Dichloroethylene	3	ND	100	200	ND	- 5	- 5	ND
Trans-1,2-Dichloroethylene	1	ND	- 50	ND	ND	- 5	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropylene	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	38	490	- 50	ND	ND	- 5	ND	50
Methylene chloride	63	120	- 50	400	ND	- 5	- 5	ND
Methyl ethyl ketone[1]	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	610	950	- 50	- 50	14	1100	1300	580
1,1,1-Trichloroethane	ND	ND	ND	ND	1	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	30	ND	- 50	- 50	12	- 5	5	25
Toluene	6	ND	- 50	ND	ND	- 5	ND	ND
1,1,2-Trichloro-1,2,2-Trifluoroethane (FR-113)[2]	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloro-1,2,2-Trifluoroethane[1]	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND
Acetone[2]	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylpropane[1]	400	ND	ND	ND	ND	ND	ND	ND
Cyclohexene[1]	400	ND	ND	ND	ND	ND	ND	ND
Cyclopentane[1]	600	ND	ND	ND	200	ND	ND	ND
Methylcyclopentane[1]	800	ND	ND	ND	200	ND	ND	ND
Pentane[1]	400	ND	ND	ND	300	ND	ND	1000
Xylene isomers[1]	60	140	ND	200	30	ND	ND	ND
Butane[1]	ND	ND	ND	ND	400	ND	ND	ND
Dimethylcyclopropane[1]	ND	ND	ND	ND	200	ND	ND	ND
Methylbutane[1]	ND	ND	ND	ND	400	ND	ND	ND
Laboratory	B&C	B&C	B&C	B&C	B&C	B&C	B&C	B&C

ND = None detected
(-) = Less than

[1]Non-priority pollutants, semi-quantified compounds
[2]Non-priority pollutants, quantified

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APPENDIX I

APPENDIX I

BASE/NEUTRAL AND ACID ORGANIC COMPOUNDS
IN GROUNDWATER SAMPLES

TABLE I-1

CONCENTRATION OF BASE/NEUTRAL AND ACID COMPOUNDS
IN WATER SAMPLES COLLECTED IN
APRIL AND MAY 1985, AND JULY 1985

BASE/NEUTRAL COMPOUNDS (micrograms per liter)	MONITOR WELL							
	MW-1		MW-2		MW-3	MW-4		MW-5
	APR - MAY	JULY	APR - MAY	JULY	APR - MAY	APR - MAY	JULY	APR - MAY
Acenapthene	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND	ND	ND
Benzidine	- 40	- 40	- 40	-120	- 40	- 40	- 40	- 40
Benzo (a) Anthracene	ND	ND	NS	ND	ND	ND	ND	ND
Benzo (a) Pyrene	ND	ND	ND	ND	ND	ND	ND	ND
Benzo (ghi) Perylene	ND	ND	ND	ND	ND	ND	ND	ND
Benzo (k) Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND
3,4-Benzofluoranthene	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyoxy) Methane	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyl) Ether	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroisopropyl) Ether	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl) Phthalate	ND	40	ND	ND	ND	ND	ND	ND
4-Bromo Phenyl Phenyl Ether	ND	ND	ND	ND	ND	ND	ND	ND
Butyl Benzyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorohaphthalene	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ether	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo (a,h) Anthracene	ND	ND	ND	ND	ND	ND	ND	10
1,2-Dichlorobenzene	ND	13	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	- 10	- 10	27
1,4-Dichlorobenzene	16	38	17	67	ND	ND	ND	ND
3,3'-Dichlorobenzidene	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl Phthalate	ND	ND	ND	ND	ND	- 25	- 25	- 25
Dimethyl Phthalate	- 25	-25	- 25	- 75	- 25	- 50	- 50	- 50
Di-N-Butyl Phthalate	- 50	-50	- 50	-150	- 50	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND
Di-N-Octyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Indeno (1,2,3-c,d) Pyrene	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	ND	ND	ND	ND	ND	ND	ND	ND

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TABLE I-1 (Continued)

CONCENTRATION OF BASE/NEUTRAL AND ACID COMPOUNDS
IN WATER SAMPLES COLLECTED IN
APRIL AND MAY 1985, AND JULY 1985

BASE/NEUTRAL COMPOUNDS (micrograms per liter)	MONITOR WELL MW-1 APR - MAY	MW-1 JULY	MW-2 APR - MAY	MW-2 JULY	MW-3 APR - MAY	MW-4 APR - MAY	MW-4 JULY	MW-5 APR - MAY
Naphthalene	ND	10	ND	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	-80	ND	-80	-240	- 80	- 80	- 80	- 80
N-Nitrosodi-N-Propylamine	-40	-40	-40	-120	- 40	- 40	- 40	- 40
N-Nitrosodiphenylamine	ND	-80	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	11	31	-10	ND	ND	-10	ND	10
ACID COMPOUNDS (micrograms per liter)								
2-Chlorophenol	31	ND	30	37	ND	- 10	- 10	71
2,4-Dichlorophenol	-10	ND	10	ND	ND	- 10	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-cresol[2]	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	- 75	ND	ND	- 25	ND
4-Nitrophenol	- 25	- 25	- 25	- 75	- 25	- 25	- 25	- 25
p-Chloro-m-cresol[2]	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	17	ND	- 10	ND	ND	-10	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND
OTHER B/N-A'S (micrograms per liter)								
2-Methyl-4,6-dinitrophenol	ND	- 50	ND	-150	- 50	ND	- 50	ND
1,1'-Sulfonylbis (4-Chlorobenzene)[1]	ND	ND	ND	ND	ND	10	ND	ND
Chlorobenaldehyde[1]	ND	ND	100	600	ND	ND	10	ND
Chlorobenzoic Acid Isomers[1]	ND	ND	1000	1000	ND	ND	- 10	200
Chlorobenzamide[1]	ND	ND	400	ND	ND	ND	ND	ND
Chlorobenzyl Acetate[1]	ND	ND	100	ND	ND	ND	ND	ND
Chlorinated Aromatic[1]	ND	ND	100	200	ND	ND	ND	ND
Diphenyl Sulfone[1]	50	50	ND	ND	ND	ND	ND	ND
Diphenyl Ether[1]	30	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclohexane[1]	20	30	ND	ND	ND	ND	ND	ND
Trichloroethanol[1]	50	50	ND	ND	ND	ND	ND	100
An unidentified compound[1]	200	ND	ND	ND	ND	ND	10	ND
Butyl Carbitol[1]	ND	ND	ND	ND	200	ND	ND	90
A c6 Ether[1]	ND	ND	ND	ND	10	ND	ND	ND
Caprolactam[1]	ND	30	ND	ND	50	ND	ND	ND
Fentichlor[1]	ND	ND	ND	ND	ND	ND	ND	200
Methyl Chlorobenzoate[1]	ND	ND	ND	50	ND	ND	ND	ND
Biphenyl[1]	ND	30	ND	ND	ND	ND	ND	ND
Sulphenone[1]	ND	70	ND	ND	ND	ND	ND	ND
A Propanoate Derivative[1]	ND	30	ND	ND	ND	ND	ND	ND
Laboratory	B&C	B&C	B&C	B&C	B&C	B&C	B&C	B&C

(-) = Less than
ND = None detected

[1]Non-priority pollutants, semi-quantified compounds
[2]Non-priority pollutants, quantified

APPENDIX J

APPENDIX J

PESTICIDES IN GROUNDWATER SAMPLES

TABLE J-1

RESULTS OF CHEMICAL ANALYSES FOR PESTICIDES AND POLYCHLORINATED
BIPHENYLS IN WATER SAMPLES COLLECTED IN
APRIL AND MAY, 1985

BASE/NEUTRAL COMPOUNDS (micrograms per liter)	MONITOR WELL MW-1		MW-2		MW-3	MW-4		MW-5
	APR - MAY	JULY	APR - MAY	JULY	APR - MAY	APR - MAY	JULY	APR - MAY
Aldrin	- 5	4.3	- 5	- 5	- 0.5	- 5	- 5	- 0.5
alpha-BHC	200	220	- 5	- 5	- 0.5	- 5	- 5	- 0.5
beta-BHC	18	29	- 5	- 5	- 0.5	- 5	- 5	- 0.5
gamma-BHC	20	33	- 5	- 5	- 0.5	- 5	- 5	- 0.5
Delta-BHC	- 5	6.6	- 5	- 5	- 0.5	- 5	- 5	- 0.5
Chlordane	- 30	- 3	- 30	- 30	- 3	- 30	- 30	- 3
p,p'-DDD	- 5	- .5	87	360	- 0.1	- 5	- 5	- 0.1
p,p'-DDE	- 5	- .5	17	45	- 0.1	- 5	- 5	- 0.1
p,p'-DDT	- 10	17	630	2400	- 0.4	- 10	36	- 0.4
Dieldrin	- 5	- .5	- 5	- 5	- 0.5	- 5	- 5	- 0.5
alfa-Endosulfan	- 5	- .5	- 5	- 5	- 0.5	- 5	- 5	- 0.5
beta-Endosulfan	- 5	- .5	- 5	- 5	- 0.5	- 5	- 5	- 0.5
Endosulfan sulfate	- 10	- 1	- 10	- 10	- 1	- 10	- 10	- 1
Endrin	- 10	- 1	- 10	- 10	- 1	- 10	- 10	- 1
Endrin aldehyde	- 10	- 1	- 10	- 10	- 1	- 10	- 10	- 1
Heptachlor	- 5	- 1	- 5	- 5	- 0.5	- 5	- 5	- 0.5
Heptachlor epoxide	- 5	- 1	- 5	- 5	- 0.5	- 5	- 5	- 0.5
PCB 1016	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1221	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1232	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1242	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1248	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1254	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1260	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	- 10	- 10	- 10	-100	ND	- 10	-100	- 10
Laboratory	B&C	B&C	B&C	B&C	B&C	B&C	B&C	B&C

(-) = Less than ND = Not detected